MARCH 19, 1956 50 Cents

AVIATION WEEK

A McGRAW-HILL PUBLICATION

Exclusive Report: SAC and the B-52

•

Aerojet Reveals New Missile Rocket Plant

First in Constant Speed Drives...

SUNDSTRAND

New electrical concept in 707 makes use of Sundstrand Constant Speed Drives

Boeing engineers applied a new concept in electrical systems to the 707 for several sound reasons. Sundstrand Constant Speed Drives had proved themselves in military service. They made possible an automatic, paralleled, constant frequency a-c system supplying plenty of stable power, with heavy overload capacity under all flight conditions. The new system offered reliability, low-cost operation, plus necessary capacity with less weight and easier utilization. Performance of this new jet airliner proves how the new concept in electrical systems . . . using Sundstrand's Constant Speed Drive . . . meets the challenge of today's . . . and tomorrow's . . . fast, high-flying jets. Could we help on your problem?

New Electrical Horizons . . .

are opening to design engineers, through co-operation between engine and airframe manufacturers and Sundstrand. With this new concept in electrical systems, expect remarkable advances in operation and performance of tomorrow's aircraft.

SUNDSTRAND AVIATION

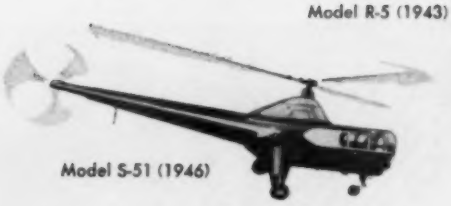
Division of Sundstrand Machine Tool Company, ROCKFORD, ILLINOIS Western District Office: Hawthorne, California

CONSTANT SPEED DRIVES • AIRCRAFT ACCESSORIES

Model R-6 (1943)

Sikorsky R-4 (1942)

Model R-5 (1943)



Model S-51 (1946)

Model S-52 (1947)

Model S-55 (1949)

Model S-56 (1954)

Model S-58 (1954)

Model S-59 (1954)

Consider Sikorsky,

for instance...

The name of Igor Sikorsky is akin to magic when you mention helicopter aircraft.

And it suggests a few facts concerning another aviation pioneer: Goodyear.

Since the introduction of the Sikorsky R-4, Goodyear tires, tubes, wheels and brakes have been used on all Sikorsky helicopters.

Since that time (with the exception of approximately 100 surplus units provided by the military), every single Sikorsky helicopter using fuel cells has been 100% equipped with Goodyear cells.

In the R-5, R-6A, S-51, S-56 and S-58 models — Sikorsky has used rotor brakes also built by Goodyear Aviation Products.

The conclusion is obvious:

When pioneers pair up, the performance is topflight!

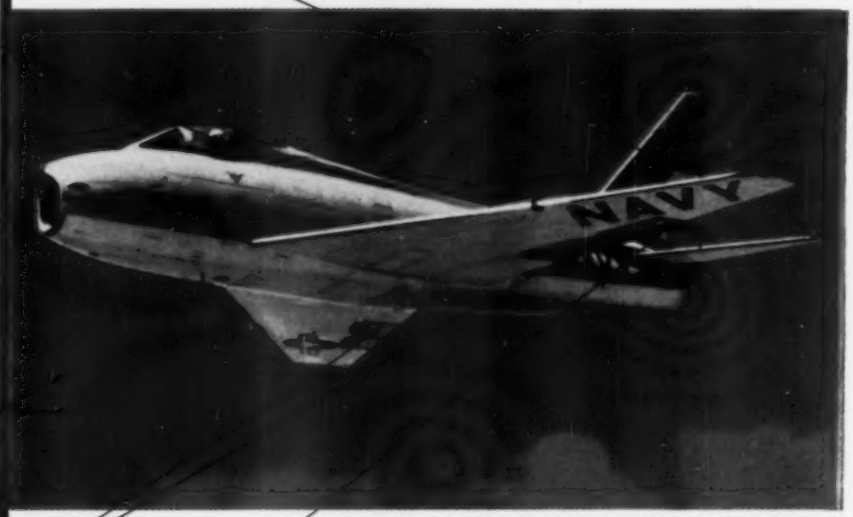
Goodyear, Aviation Products Division, Akron 16, Ohio, and Los Angeles 54, California.

GOODYEAR AVIATION PRODUCTS

FACILITIES + ABILITIES = EXTRA *plus* IN PERFORMANCE

9 HOOVER ACTUATORS

flex the muscles of the Navy's New Fury Jet



North American FJ-4 Fury. Now in production at North American's Columbus, Ohio division for the Navy, this carrier-based, swept-wing jet fighter has a high rate of climb and speed in excess of 690 mph.

Hidden under the skin of North American's new FJ-4 Fury jet are nine custom-built Hoover Electric actuators that provide precise, dependable power and control—for flying the Navy's latest Super Jet.

Exactingly designed—and precisely built—for maximum performance under all conditions—these Hoover-built electric power control units have been an integral contribution to American aircraft development for more than a decade. Aircraft designers, engineers and pilots alike—rely on Hoover dependability—and Hoover has always repaid that confidence with Performance PLUS!

Hoover Electric will design and manufacture special actuators and motors, special gearing and complete power package units for any application—in experimental or production quantities. Write today!

Hoover Electric Motors And Actuators Are Providing Dependable Power And Control For Operating

horizontal stabilizers	camera doors
camera drive	fuel jettison actuator
ram air inlet	cockpit canopy
landing hook	pilot seat actuators
aileron control	hydraulic pump
hot air valve	high pressure air pumps

HELCO

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2100 South Stoner Avenue
Los Angeles 25, California
Eastern Representative — Columbus, Ohio

AVIATION CALENDAR

Mar. 21-23—American Power Conference, sponsored by Illinois Institute of Technology, Sherman Hotel, Chicago.

Apr. 2-4—American Institute of Electrical Engineers, Southwest District Meeting on "Electricity in Aircraft," Baker Hotel, Dallas, Texas.

Apr. 9-12—Society of Automotive Engineers, national aeronautic meeting, aeronautic production forum and aircraft engineering display, Hotel Statler, New York, N. Y.

Apr. 10-11—Symposium for Management on Application of Analog Computers, sponsored by Midwest Research Institute, University of Kansas City, Kansas City, Mo.

Apr. 15-19—Airport Operations Council, 9th annual conference, Hotel Warwick, Philadelphia.

Apr. 16-18—Aero Medical Association, Drake Hotel, Chicago.

Apr. 18-19—First Annual National Industrial Research Conference, sponsored by Armour Research Foundation, Hotel Sherman, Chicago.

Apr. 19-20—Annual Meeting of the Science Section of the Environment Equipment Institute, Sheraton Hotel, Chicago.

Apr. 22-26—American Association of Airport Executives, 29th annual convention, Hotel Carter, Cleveland, Ohio.

Apr. 26—Institute of Navigation, annual regional meeting, Friendship International Airport, Baltimore, Md.

Apr. 26-27—Institute of the Aeronautical Sciences Southeastern Student Conference, Georgia Institute of Technology, Atlanta, Georgia.

Apr. 30-May 4—Society of Aeronautical Weight Engineers, 15th national conference, El Cortez Hotel, San Diego.

May 2-3—Air Traffic Conference of the Air Transport Assn., Spring Meeting, Hotel Radisson, Minneapolis, Minn.

May 2-5—Twelfth Annual National Forum of the American Helicopter Society, Sheraton-Park Hotel, Washington, D. C.

May 3-4—Sixth Annual Institute of Aeronautical Sciences, West Coast Student Conference, Los Angeles.

May 6-9—Second Annual Symposium on Flight Test Instrumentation, sponsored by Instrument Society of America, Bell Aircraft Corp., Convair and Temco Aircraft Corp., Fort Worth, Tex.

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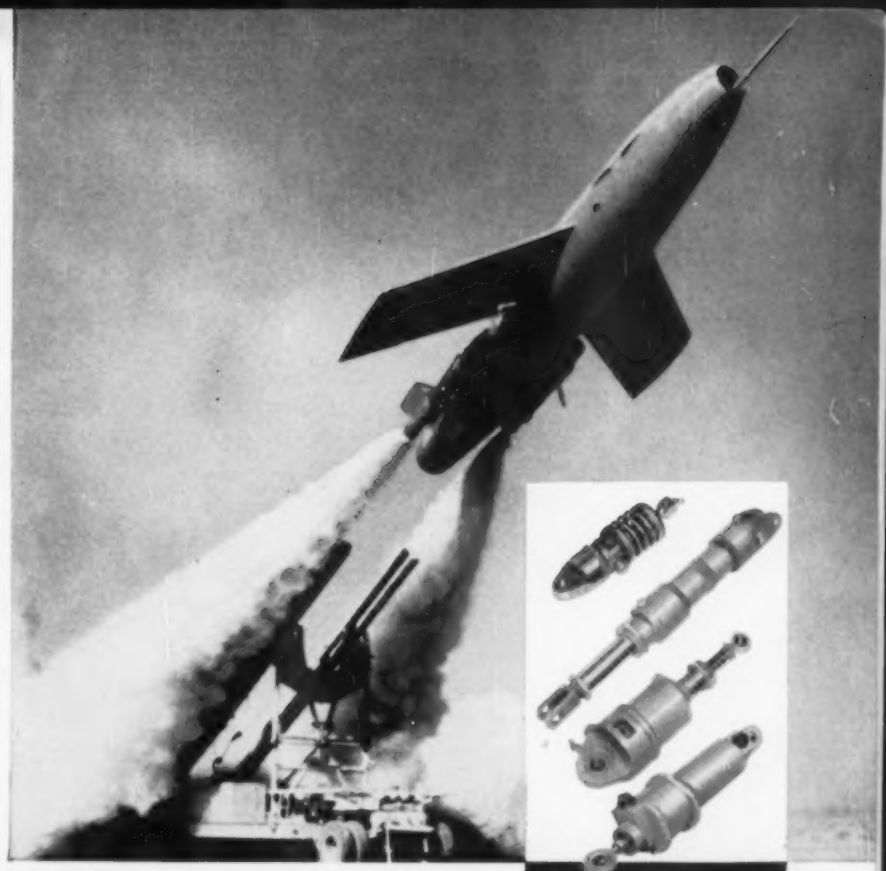

The Chance-Vought Regulus takes to the air. Precision actuating assemblies for this and other guided missiles are part of Ex-Cell-O's production.

Four typical actuating assemblies precision-built by Ex-Cell-O for planes and guided missiles.

You Can Be Confident of Precision
With Ex-Cell-O Parts or Assemblies

Almost every plane you see streaking across American skies, flies with Ex-Cell-O precision parts or assemblies—precision-built to fulfill ever more rigid design specifications.

From design to final inspection skilled personnel, working with the most complete manufacturing facilities available, build precision into every part and assembly. That's why the aircraft industry has placed confidence in Ex-Cell-O for over 30 years.

For parts or assemblies that meet your most rigid specifications—that meet your delivery schedules—send your print or sketch to:

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SILASTIC Insulation Protects "Nerve System" of Jet Aircraft at Temperatures from −80 F to +400 F!

Here's another way Silastic protects wiring systems . . . Silastic-covered clips secure lines and protect them against heat and vibration. Easily installed or removed, these clips keep a firm grip at extreme temperatures without losing their vibration-absorbing resilience.

Now you can get a thoroughly reliable, all purpose wire that costs less than other wires designed for service at temperatures ranging from −70 F to +350 F. Manufactured to meet Mil-W-8777 USAF, new "350" high temperature aircraft wire by *Auto-Lite* is insulated with *Silastic**, the Dow Corning silicone rubber that has maximum resistance to heat, cold, corona and moisture.

Silastic offers corona resistance far superior to that of any other kind of rubber. Its dielectric properties, including dielectric strength and dissipation factor, show no appreciable change at temperatures ranging from −80 F to +400 F. Long exposure to moisture condensing or humid conditions causes no appreciable change in its mechanical, physical or dielectric properties. Moreover, *Silastic* contains no nutrient to support the growth of fungus. *Auto-Lite* 350 can be easily code marked and soldered without melting the insulation. And "350" actually costs less than high temperature wire previously available!

That's typical of the way *Silastic* serves the aircraft industry wherever rubbery properties are needed at extreme temperatures.

Mail this coupon *for latest information on* **Silastic.**

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Midland, Mich., Dept. 0903-B

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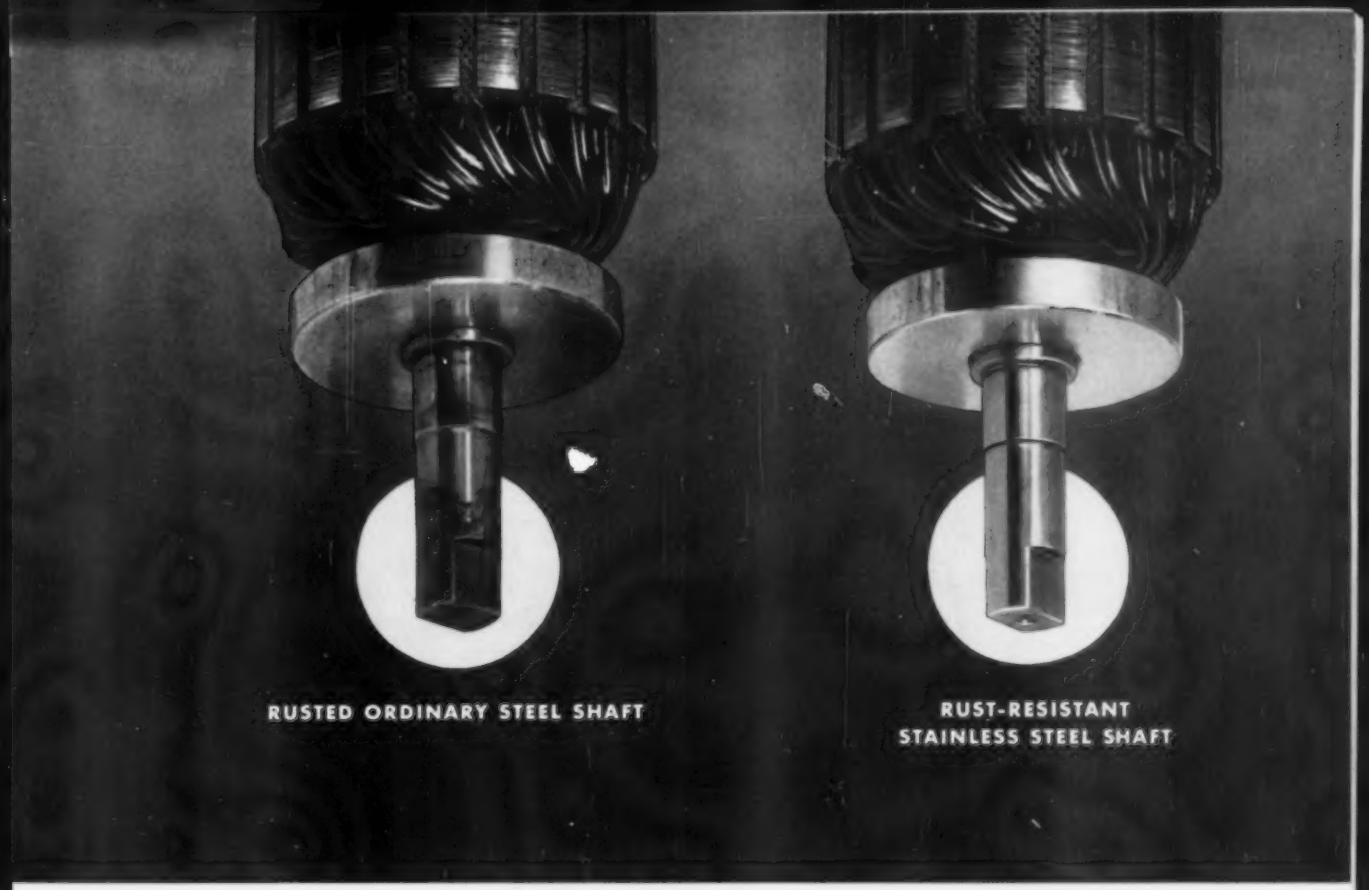
*TM Dow Corning Corporation



Stainless Steel Shafts on G-E Aircraft Motors Eliminate Harmful Corrosion, Pitting

At General Electric, today's demand for even better aircraft motors is reflected right down to the steel used for the shafts. To assure proper function where moisture is a big factor, G. E. now uses stainless steel for aircraft motor shafts.

Stainless steel shafts resist rust and corrosion which can cause improper function of the driven part by literally bonding it to the shaft. Also, rust on ordinary steel shafts can build up to the degree where the rotor is unable to turn under load. Motor failure results.

STAINLESS STEEL SHAFTS are just one of the many extra design features standard on G-E aircraft motors. Others include Mylar* insulation, newly developed Alkanex† wire, special bearing lubrication, nickel finish, and protection against radio interference radiation.

Superior design is only a part of the complete G-E story on aircraft motors. The industry's most experienced application engineers, unexcelled testing laboratories, and modern manufacturing facilities all add up to on-time delivery of the right G-E aircraft motors for your application.

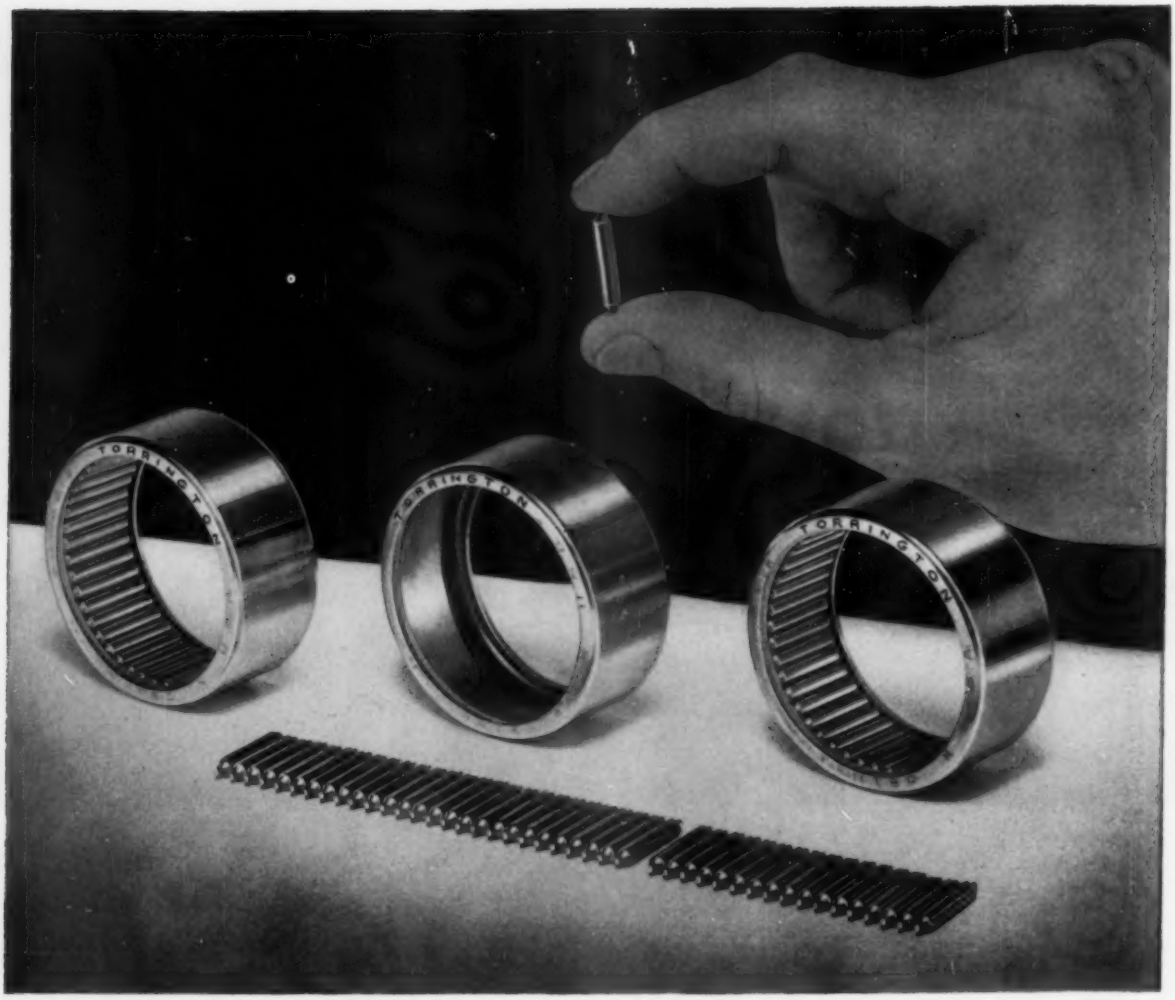
FOR PROMPT ATTENTION, contact your local G-E Apparatus Sales Office early in your planning. Or write for descriptive Bulletin GEA-6217 to Section 634-3, General Electric Co., Schenectady 5, N. Y.

*DuPont trade-mark for polyester film

†Trade-mark of the General Electric Company

Progress Is Our Most Important Product

GENERAL ELECTRIC



Here's where the **TORRINGTON NEEDLE BEARING** *gets its precision*

This Needle Roller is the "work horse" of the Torrington Needle Bearing. Its jewel-like precision is the key to smooth performance of the Needle Bearing. That's why in every manufacturing step—from alloy selection to final polishing—the rollers are checked against strict quality controls.

A full complement of Needle Rollers, mounted in a precision-made, case-hardened retaining shell, provides a maximum number of contact lines, giving the Torrington Needle Bearing a higher radial load capacity than any other bearing of comparable size.

The Torrington Needle Bearing delivers top anti-friction performance—with low coefficient of both starting and running friction.

For more than twenty years, our Engineering Department has helped designers and manufacturers throughout industry to adapt the unique advantages of the Needle Bearing to their products. Let us help you make the Needle Bearing "standard equipment" in yours.

See our new Needle Bearing Catalog in the 1956 Sweet's Product Design File —or write direct for a catalog.

TORRINGTON NEEDLE BEARINGS
Give you these benefits

- low coefficient of starting and running friction
- full complement of rollers
- unequalled radial load capacity
- low unit cost
- long service life
- compactness and light weight
- runs directly on hardened shafts
- permits use of larger and stiffer shafts

THE TORRINGTON COMPANY
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District Offices and Distributors in Principal Cities of United States and Canada

TORRINGTON BEARINGS

Needle • Spherical Roller • Tapered Roller • Cylindrical Roller • Ball • Needle Rollers

RECORD SIX YEAR PRODUCTION PAVES WAY FOR NEW GIANTS

Largest airframe assembly subcontracted. Ryan is producing huge aft fuselage sections for the Boeing KC-135 jet tanker-transport. This new project follows six years of continuous on-time production of fuselage sections for Boeing's KC-97.

It's a tail of two cities. The huge structures built by Ryan in San Diego must mate perfectly with sections produced at Boeing's Seattle-Renton plants. This demands precision manufacturing, perfect planning and flawless coordination.

Techniques, planning and skill save money. Ryan reduced costs 40% during production of KC-97 assemblies. This saving was passed on to Boeing and the Air Force – to provide more aircraft per defense dollar. This is just one example of the outstanding cost-performance at Ryan. The same manufacturing efficiency and smooth integration is found in the production of fuselage sections for Sabre Jet fighters and other military and commercial airframe components such as fuel tanks, control surfaces, wing sections.

Established, financially stable. Ryan performs subcontracts without progress payments from customers. A veteran of 33 years exclusively in the aircraft business, Ryan understands the industry's problems as only an aircraft company can. It has the modern facilities, most advanced manufacturing techniques, and highly skilled engineering and technical personnel needed to produce the industry's most difficult production assignments.

For 33 years, Ryan has excelled in designing and producing high quality aircraft, power plants and avionics—built at low cost, delivered on time.

RYAN
AERONAUTICAL COMPANY
SAN DIEGO 12, CALIFORNIA

The Nike needs accurate fins...

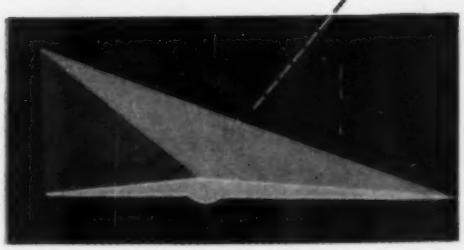
THE Nike—deadly ground-to-air guided missile—requires fins that are light, strong and accurate.

Kaiser Aluminum forgings meet the rigid specifications on all counts, with a surface finish so satisfactory that *no machining is necessary!*

These are the dimensional tolerances and surface finish requirements for the fin:

DIMENSIONAL TOLERANCES			
Mis-match	1/64" Max.	Thickness	—0 +1/32"
Length	±1/32"	Angular	±1/2°
Width	±1/32"	Straightness	.010" in 10" length

SURFACE FINISH	
Parallel to base	125 RMS
Perpendicular to base	250 RMS
Local depressions	.005" per inch length .015" maxm. depth



Kaiser Aluminum forges them!

Extremely *complicated* parts can be forged by Kaiser Aluminum to close tolerances, with smooth surfaces that need no costly finishing.

If *you* have a part that must be light and strong, with close tolerances, think of Kaiser Aluminum forgings.

A Kaiser Aluminum engineer will be glad to help you at no obligation.

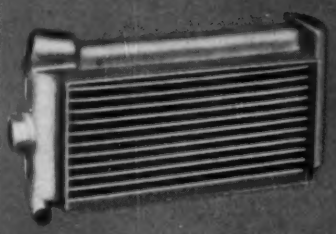
For complete information, contact any Kaiser Aluminum sales office listed in your telephone directory. Kaiser Aluminum & Chemical Sales, Inc., *General Sales Office,* Palmolive Bldg., Chicago 11, Illinois; *Executive Office,* Kaiser Bldg., Oakland 12, California.

Kaiser Aluminum

setting the pace—in growth, quality and service

COOLED FROM THE GROUND UP

...BY HARRISON!



Convair's New Delta-Wing "Pogo" Relies on Harrison Oil Coolers!

Vertical take-off . . . streaking straight up! Tremendous heat is generated to get this Navy fighting ship off the ground. And when it comes to heat like this . . . *that's a job that calls for Harrison!* Specially designed Harrison aluminum oil coolers keep temperatures level for peak operating efficiency. You'll find Harrison coolers on the finest, fastest fighters. These oil coolers save weight, save space—open the door on new, even more modern design. And Harrison's outstanding research facilities are constantly at work developing the latest advances in heat exchangers. If you have a cooling problem, look to Harrison for the answer.

GM
GENERAL MOTORS

TEMPERATURES MADE TO ORDER

HARRISON

RADIATOR DIVISION, GENERAL MOTORS CORP., LOCKPORT, N.Y.

FACTS BEHIND WESTERN'S *Champagne Flights...*

Travel experts acclaim the celebrated "Champagne Flights" of Western Airlines as one of America's smartest air services. Behind their popularity lie carefully planned innovations in luxury air travel... and advanced sales techniques to match. As a supplier of parts and accessories to Western Airlines, PAC takes pride in its contribution to this achievement.

PAC DELIVERS FAST... PROVED BY WESTERN'S STUDY

A study conducted by K. W. Kendrick, Director of Purchasing for Western Airlines, has proved the advantages in using PAC as a source of supply. Mr. Kendrick's survey revealed that of all orders placed with PAC, over 75% were completed within 30 days and over 90% within 60 days. Pacific Airmotive's "APS"* has enabled Western to reduce inventories substantially, thereby releasing inventory dollars for other purposes. PAC is proud of this record and the confidence that Western has placed in its service. If you would like the complete story of how PAC can provide similar savings and service to your organization, write, wire or phone today.

**APS—Advance Planning Service*

PACIFIC AIRMOTIVE CORPORATION

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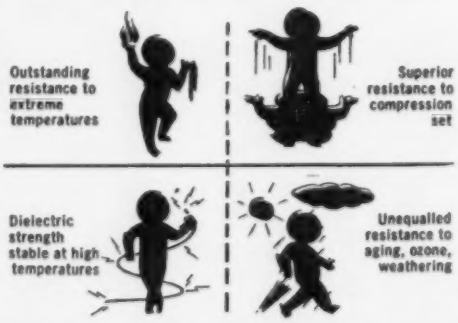
7-806

Looking for *really* cold-resistant rubber? General Electric's Class 500 silicone rubber offers flexibility down to 150 F below zero! Unmatched in low-temperature serviceability by any known elastomer, it has become standard in the aircraft industry for seals and gaskets around airframe openings. With essentially the *same flexibility* at minus 90 F as at room temperature, it greatly simplifies your design problems.

Where can YOU use G-E silicone rubber?

There's a kind for almost every requirement, classified according to dominant property for easy selection and specification. For example: Class 300 offers the best recovery after compression *of any known rubber!* Class 700 provides serviceability *up to 600 F!* Which class is best for *you?*

G-E silicone rubber provides...


Outstanding resistance to extreme temperatures
Superior resistance to compression set
Dielectric strength stable at high temperatures
Unequalled resistance to aging, ozone, weathering

FREE! send today for a NEW, REVISED "LIGHTNING SELECTOR"!
See your "Sweets Product Design File" (3c/Ge) for details

Progress Is Our Most Important Product

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Please send me, at no obligation, technical data on G-E silicone rubber, including a newly revised "Lightning Selector" and up-to-date list of fabricators

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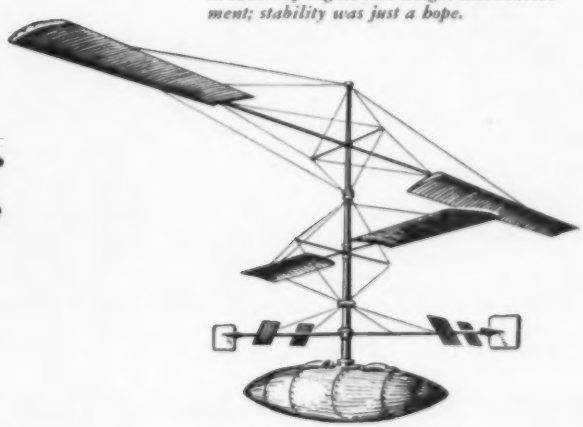
IN CANADA: MAIL TO CANADIAN GENERAL ELECTRIC COMPANY, LTD., TORONTO

Today's Piasecki Turbo Transporter can carry more than five tons of cargo at a top speed of over 160 m.p.h.

This early two-rotor helicopter was designed in 1920. Lifting its own weight was achievement; stability was just a hope.



in HELICOPTERS... it takes more today

Progress in helicopter design takes a lot more in bearing performance—and Shafer Aircraft Bearings are providing it for many of today's advanced designs of rotary-wing aircraft.

The three main reasons why Shafer is specified in helicopter design are:

1) Automatic self-alignment—*even under oscillatory loads.* This Shafer advantage offers a welcomed answer to the most severe problem faced by the designer of this class of aircraft.

2) Full capacity—*under combined loads.* Two rows of rollers enable Shafer Bearings to carry any combination of radial-thrust loads on full contact area under all conditions of misalignment.

3) Relubrication—*without disassembly.* Lubricating groove and commuting hole through outer race enable you to put lubricating fitting on mounting member and relubricate without removal or disassembly.

These and many other specialized Shafer® Aircraft Bearing features can save valuable engineering time ...save space and weight in finalized design...and save time and expense in production man-hours.

Why not see how they can save for you? Write, wire or call: Shafer Aircraft Bearing Division, 801 Burlington Ave., Downers Grove, Ill. Meanwhile, write for new full-color catalog No. 54.

Double row shown. Also, single row bearing, rod end and torque tube bearings. Design features 10° plus or minus self-alignment...easy relubrication without disassembly...high radial thrust load capacity ...exceptional shock-load reserve strength.

SHAFER BEARING DIVISION **CHAIN BELT COMPANY**

Big new member of Boeing's jet airliner team

The nation's first jet transport, the Boeing 707 Stratoliner, now has a teammate—the larger, newly announced Boeing Intercontinental.

This team of Boeing airliners will be the first to provide swift, vibration-free travel over the routes for which each was specifically designed: the Stratoliner, over domestic and international routes; the Intercontinental, over longer-range nonstop transocean routes.

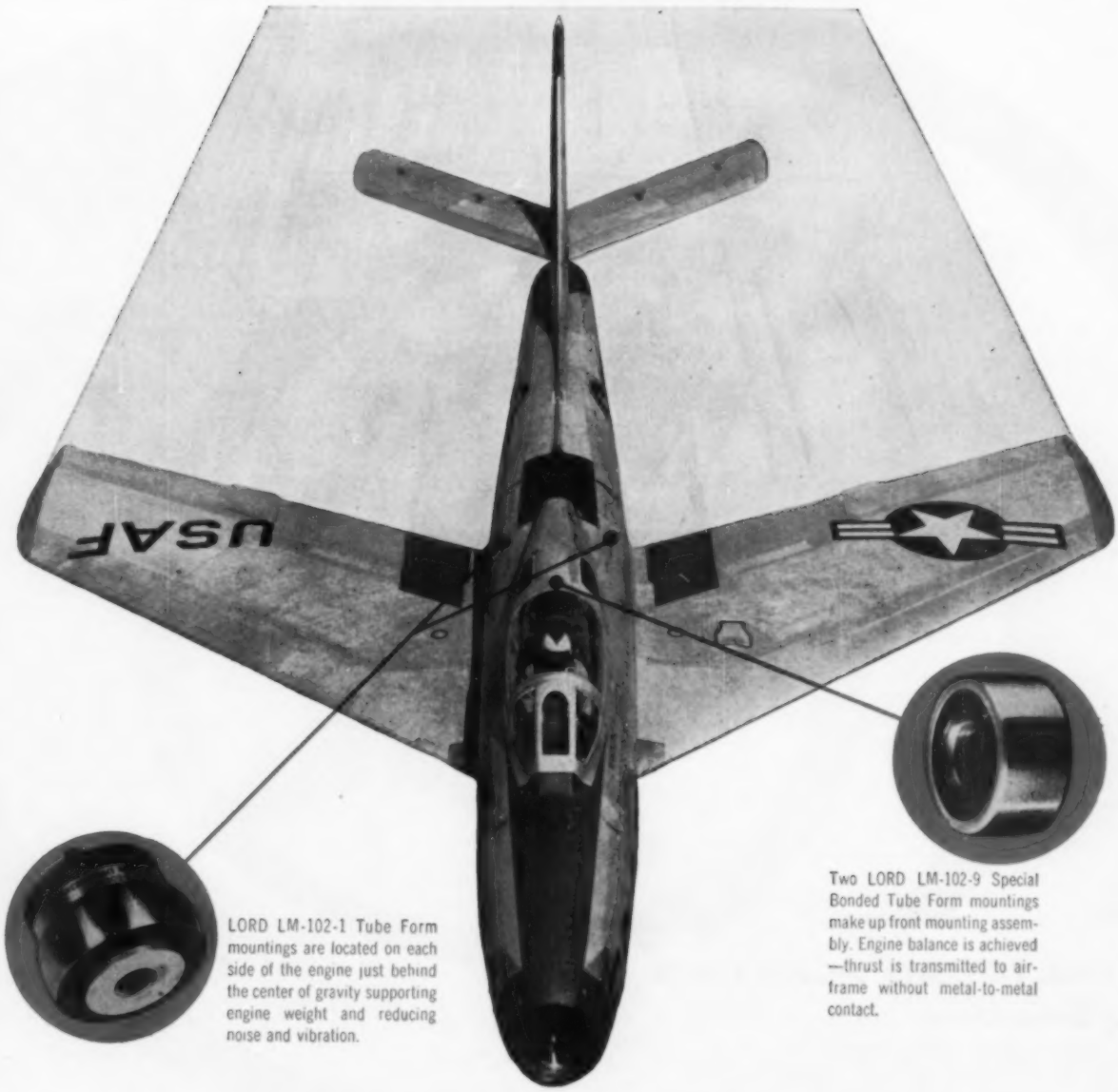
The new Intercontinental, largest jet transport offered by any manufacturer, will carry up to 124 passengers in the standard version, 145 in tourist. It will cruise at 575 mph. Its range, with full payload and full fuel reserves, will be more than 4,000 miles, enabling airlines to offer all-season, all-weather nonstop transocean service in both directions.

Already three airlines have ordered fleets of Intercontinentals: Pan American World Airways, Air France and Sabena. Stratoliner fleets, with deliveries beginning late in 1958, are going to Pan American, American Airlines, Braniff International Airways, Continental Air Lines and Trans World Airlines. The Boeing Intercontinental will cross from New York to London in 5 hours, 35 minutes; from New York to Brussels or Paris in 6½ hours or less. The 707 prototype has crossed the United States in 3 hours, 58 minutes.

Both Boeing Jets will be equipped with two new Boeing developments: a system of sound suppressors to quiet the engines while on the ground and in flight, and jet thrust reversers, which will permit the use of shorter runways than would otherwise be the case.

This great team of high-performance jet transports has behind it the benefits of Boeing's unique experience in building and thoroughly flight-testing a jet transport prototype, and producing more than 1,200 large, multi-jet B-47 and B-52 aircraft.

BOEING



LORD LM-102-1 Tube Form mountings are located on each side of the engine just behind the center of gravity supporting engine weight and reducing noise and vibration.

Two LORD LM-102-9 Special Bonded Tube Form mountings make up front mounting assembly. Engine balance is achieved —thrust is transmitted to airframe without metal-to-metal contact.

F-84F: swept-wing, super-fast and **smooth**

A new standard in smooth, comfortable flight for jet aircraft has been established with the use of the first volume-produced resilient mountings for jet engines. LORD bonded rubber mountings are being used to isolate engine vibrations on the F-84F "Thunderstreak".

The entire 2500-pound weight and 7200-pound thrust of the power plant, a Curtiss-Wright J65 jet engine, is carried by the specially-designed LORD three-point suspension system. The LORD bonded rubber engine mountings were designed to withstand the extremely high operating temperatures.

On most of our modern aircraft—jet, turboprop and reciprocating —LORD mountings provide increased comfort and greater safety through the reduction of noise level and pilot fatigue from vibrations. For more information on LORD bonded rubber products, call your nearest LORD Field Engineer, or write the home office, Erie, Pa.

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designers and producers of bonded rubber products since 1924

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LORD MANUFACTURING COMPANY • ERIE, PENNSYLVANIA

STRETCHED PLASTICS
by Swedlow
For McDonnell's F-101-A

Canopies and wind-shields using stretched acrylic (MIL-P-5425), are now being produced by Swedlow Plastic Co. for the F-101A, the new supersonic fighter with tremendous fire power built by the McDonnell Aircraft Corp. of St. Louis, Mo.

The culmination of a Swedlow-sponsored development program extending over several years, this process involves the molecular rearrangement of acrylic sheeting by mechanical stretching, improving toughness, resistance to solvent and stress crazing, reducing notch sensitivity and resulting in a substantial saving in weight.

For information on "Stretched Acrylics" and other plastic glazing materials, contact the Swedlow plant nearest you.

Swedlow PLASTICS CO.

LOS ANGELES, CALIFORNIA • YOUNGSTOWN, OHIO

MARCH 19, 1956

AVIATION WEEK

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60,673 copies of this issue printed

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EDITORIAL

Lessons of the Hebert Hearings

The aircraft industry lives in a goldfish bowl and should act accordingly. This is the most important lesson to be learned from the recent Congressional investigation conducted by a House armed services subcommittee headed by Rep. Edward Hebert (D.-La.). This is a lesson the aircraft industry should have learned long ago, but it was apparent from the behaviour and testimony of some company officials that this fact is not yet fully acknowledged as a management guide.

Mr. Hebert was looking for any evidence that might indicate aircraft manufacturers' profits were out of proportion to the services they rendered. On this score Mr. Hebert's search was unfruitful. However, with few exceptions, the industry missed a fine opportunity to get off the defensive and air their very real problems in doing business with the government before an influential group that might help in seeking redress.

Briefing Criticized

Perhaps this was due, as some industry sources bitterly charge, to sketchy and inadequate briefing by their trade association leaders in Washington. Perhaps it was due to the fact that some managements are overly timid in seeking frank discussion of their problems with government customers. At any rate, for the most part they played a strictly defensive game. It remained for William Allen of Boeing, as we pointed out in our issue of March 5 on page 20, to take the offensive and use the opportunity afforded by the Hebert hearings to present the industry's case in frank and realistic fashion.

There is evidence that Congress will listen sympathetically to proposals to abolish the vague and capricious standards of the independent Renegotiation Board and establish a clear, uniform profit limitation on government business that will safeguard the taxpayers and give the individual firms that deliver sound products on time a satisfactory margin for financial growth.

Industry's Task

There is a continuing need for the spirit and tactics displayed by Mr. Allen if the aircraft manufacturing industry is to free itself from many of these government-imposed, growth-limiting shackles. This is a task that cannot be done effectively by paid propagandists hired temporarily for a national-scale "snow" job. It must be done by the leaders of the aircraft industry who can speak authoritatively from the knowledge and conviction of their own experience and the records of their firms. The aircraft corporation presidents who shunned the Hebert hearings and sent subordinates to Capitol Hill did neither their own firms nor the cause of their industry any service.

There are some danger signals that appeared during the Hebert hearings that managements would do well to heed. The proper scale of overhead expenses chargeable to government contracts will continue to be a bitter bone of contention. Lack of uniformity between Air Force and Navy in allowing management bonuses to be charged off against government contracts is sure to draw bitter criticism from Congress and strong recommendations for a new policy. The accumulation of a sizable contingent of retired Army, Air Force and Navy officers on a government contractor's payroll will certainly provide a large degree of vulnerability to firms that indulge in this practice.

Although the Hebert subcommittee scrutinized other overhead items, including contributions to trade associations such as the Aircraft Industries Assn., engineering scholarships, contributions to educational institutions and advertising costs, there is no indication of any policy change recommendations on these items. Again the industry lost a fine opportunity to explain publicly the contributions to national welfare made by these educational donations and its necessity for advertising.

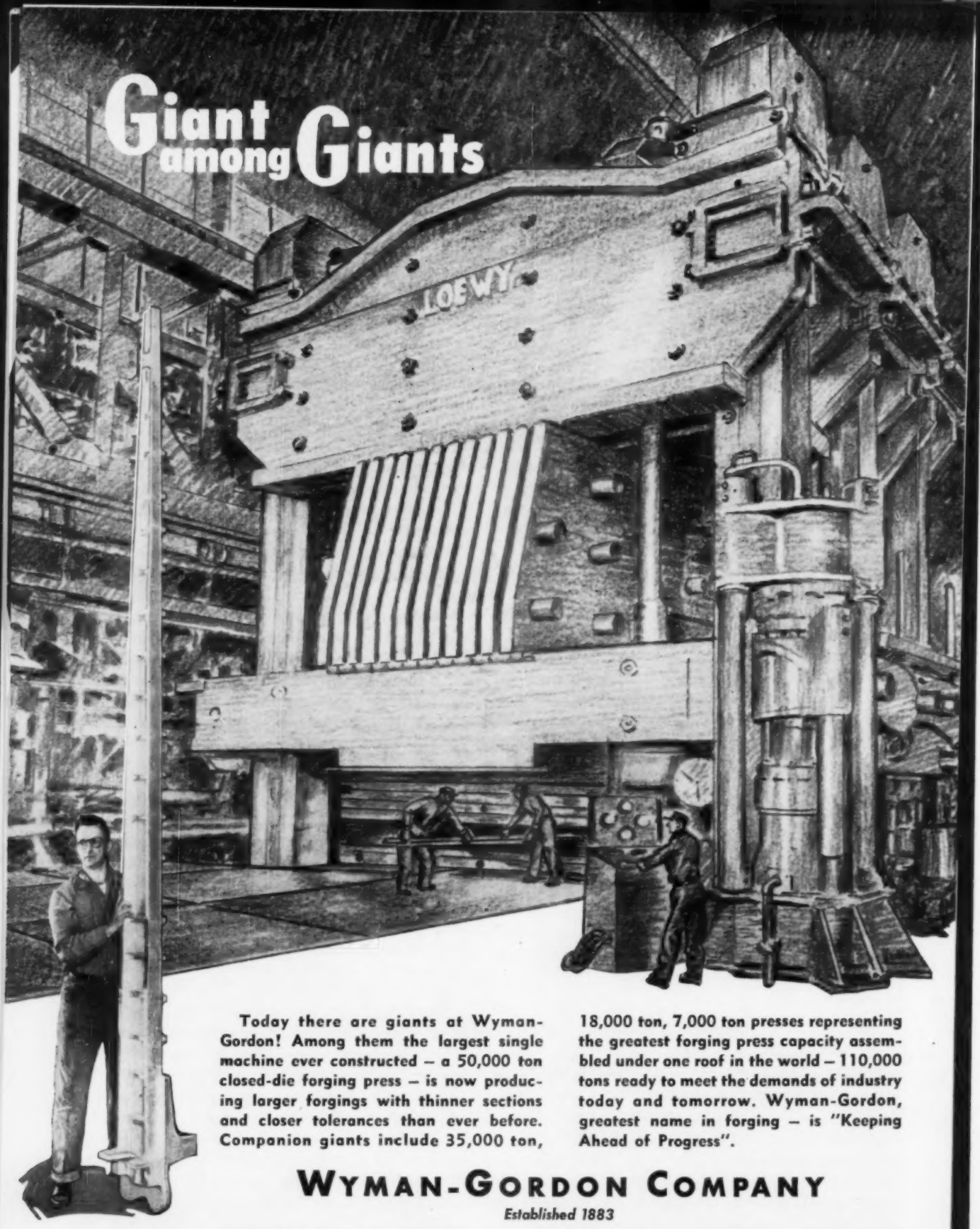
More Probes

There will be more Congressional investigations of the aircraft industry and its contributions to the national welfare. At least three more Congressional groups are already doing staff work on aircraft investigations, and industry leaders can look forward to the certainty of more appearances on Capitol Hill before the Presidential election. These appearances are not an odious task to be sloughed off on subordinates but a fine opportunity to report on the state of the industry and on their individual firms to the American people, who are, in the final analysis, the most important stockholders the industry has.

With the lessons of the Hebert hearings behind them, we earnestly entreat aircraft industry management to organize a firm, factual and aggressive policy of periodically reporting to the American people and conducting their individual corporate affairs in a manner that can stand the full glare of public inquiry when required. Any other policy will deny the industry the opportunity for natural growth it needs to do its job effectively.

—Robert Hotz

Giant among Giants



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WHO'S WHERE

In the Front Office

Cramer W. LaPierre, executive vice president, General Electric Co., N. Y., with continuing over-all responsibility for Electronic, Atomic and Defense System groups.

George W. Haldeman, formerly special assistant to the Director of the Office of Aviation Safety of CAA, has joined National Airlines, Inc. in an executive capacity.

Monroe Maller, vice president-general manager, Avien Service Corporation of California, Culver City, Calif.

Edward C. Light, vice president-Research and Quality Division, and a director, Summers Gyroscope Co., Santa Monica, Calif.

Harold B. Seifert, vice president operations-administration, Continental Air Lines.

Dr. Louis Ten Eyck Thompson, vice president-research, Norden-Ketay Corp., N. Y.

Maj. Gen. Victor E. Bertrandias, former USAF Deputy Inspector General, retained by Pan American World Airways as adviser on jet operations.

Alan F. Thompson, vice president-manufacturing, Arma Division of American Bosch Arma Corp., Garden City, N. Y.

Correction: **Charles D. Manhart**, assistant to George E. Stoll, vice president and group executive of Bendix Aviation Corp.

Honors and Elections

William A. M. Burden, senior partner of William A. M. Burden and Co., a director of Lockheed Aircraft Corp.

Gen. Nathan F. Twining USAF Chief of Staff, to receive the 1956 General William Mitchell Award of the Aviators' Post No. 743 of the American Legion on April 11.

Andrew B. Shea, president of Panagra, awarded the Order of Condor of the Andes in the rank of commander by the Bolivian Government "In recognition of Mr. Shea's and Panagra's contribution to the development of commercial aviation in Bolivia."

Changes

Albert L. Varrieur, general manager, Denver Division, the Martin Co. also, **William G. Purdy**, chief engineer; **Charles H. Williams**, manager-service and test; **William G. Ruckert**, manager-customer relations; **Robert N. Blakey**, manufacturing manager; **Robert G. Swope**, master planning manager; **Roy G. Andrews**, industrial relations manager; **Thomas P. Hudock**, plant controller; **Ross B. Hooker**, procurement manager; **Hugh P. Campbell**, quality control manager.

Dr. Robert F. Brodsky, head of the aerodynamics group, Convair, Pomona (Calif.) Division.

Col. Howard M. McCoy, on the staff of the Computer Systems Division, Ramo-Wooldridge Corp., Los Angeles, Calif.

Harry F. Kniesche, chief of manufacturing and **Col. Harold J. Conway**, production and engineering consultant, Aircraft Armaments, Inc., Cockeysville, Md.

Joseph J. Langford, manager-Air Force contracts, Kollsman Instrument Corp., Elmhurst, N. Y.

INDUSTRY OBSERVER

► **Highest thrust ever produced by a single rocket motor of any type—either liquid or solid propellant—has been achieved with a solid-propellant charge developed by the Rocket Fuels Division of the Phillips Petroleum Co. Eventual use of the rocket will be in booster applications. First-stage powerplants for intercontinental ballistic missiles, now producing thrusts near one million pounds, are liquid-propellant "cluster" motors. Thrust of the Phillips unit must be well over the 125,000-lb. level reported for these individual ICBM engines.**

► Sir John Slessor, Britain's former chief of air staff, is advising the British government to produce U. S.-designed aircraft under license. He would like to see Britain buy manufacturing rights to one of the Century series (F-100, etc.).

► **Best bet to recapture the world speed record for the United States is the Lockheed F-104A powered by a General Electric J79 turbojet. The production version F-104A has a reported speed-at-altitude capability in the 1,200 mph. range.**

► Eastern Airlines has bought 12 Convair Model 440 Metropolitan transports for delivery beginning early in 1957. Purchase reflects Eastern's immediate equipment requirements to meet competitor's new routes authorized last year by Civil Aeronautics Board.

► **Bell Aircraft Corp. Helicopter Division has test flown a new gas turbine powered helicopter at the Army's Camp Rucker, Ala., aviation center. The new model is powered by French Artouste turbojets.**

► Extensive work-management study of the Royal Air Force is scheduled over the next few years in an effort to improve its efficiency.

► **Capital Airlines' Viscount turboprop which crashed in late February while landing at Chicago Midway Airport may be rebuilt if Vickers-Armstrongs can ship fuselage jigs across the Atlantic. The fuselage split vertically behind the cockpit as a result of belly impact. Long delay in obtaining a replacement adds support to proposals that the transport be repaired and returned to service.**

► Royal Air Force task force which will operate during the forthcoming atomic tests in the Monte Bello Islands will use Canberra, Varsity and Shackelton aircraft and Westland S-56 helicopters. Valiant bombers also are to be assigned to the tests.

► **Air Research and Development Command's Atmospheric Analysis Laboratory at the Cambridge, Mass., Research Center will begin revamping USAF flight planning procedures in July. The new procedures will adapt pressure pattern navigation to the higher altitudes now attainable, set up a common terminology for flight crewmen and meterologists, divide flight planning work load more efficiently and fit flight planning techniques into the upcoming jet traffic control situation.**

► First Douglas all-weather B-66 tactical bomber, powered by two Allison J71 turbojets and capable of delivering nuclear weapons, has been delivered to the 17th Bomb Wing of Tactical Air Command's Ninth Air Force at Hurlburt AFB, Fla. B-66 is designed to operate at speeds of 600-700 mph. and altitudes of over 40,000 ft.

► **First trials of a prototype liquid-oxygen breathing system in a British aircraft are now under way. Tests, sponsored by the Ministry of Supply, are being carried out in a Meteor N.F.11 with a system made by Normalair Ltd. A Canberra B.2 will be used in later tests.**

► Italian Air Staff is evaluating Britain's Short Seamew anti-submarine aircraft for possible use by the Italian air force.

the new

MODEL 73

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by Beechcraft

BEECHCRAFT has designed and built another outstanding military trainer at its own expense and risk — and now offers it to the military services throughout the free world as the WORLD'S MOST ECONOMICAL JET TRAINER.

The Model 73 Beechcraft Jet Mentor is based on the famous Beechcraft T-34 Mentor, in daily use by the military forces of the United States and many foreign countries.

In flight and handling characteristics the two airplanes are so alike that transition from one to the other will be a very simple step for a student; or in fact the student could start his training with the Jet Mentor without previous flight experience. Inquiries are invited.

The Beechcraft Model 73 Jet Mentor
PERFORMANCE AND SPECIFICATION DATA

(Engine: Continental J69-T-9 Turbojet)

Cruising Speed	245 mph
High Speed (at 15,000 feet)	295 mph
Diving Speed	500 mph
Service Ceiling	28,000 feet
Range (maximum with reserve)	450 miles
Gross Weight	4,521 pounds
Empty Weight	2,925 pounds
Useful Load	1,596 pounds
Load Factor (ultimate)	11.25 G's
Rate of Climb	1,400 fpm

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Beech Aircraft Corporation, Wichita, Kansas, U. S. A.

BEECH BUILDS: T-34 Trainers for the USAF and USN; L-23 Transports for the U. S. Army; the Model 73 Jet Mentor; MD-3 Mobile Power Generators; and for Business — the Beechcraft Super 18 Executive Transport, the Beechcraft Twin-Bonanza and the Beechcraft Bonanza.

Washington Roundup

Defense Profits Reports

The staff report of the House Appropriations Military Subcommittee on profits and policies with regard defense contracts is due for release this week.

The investigation was launched a year ago after Rep. George Mahon (D.-Tex.), subcommittee chairman, declared in a floor speech that the taxpayers are being taken "for a merry ride" by the excessive profits permitted by the business-man administration of the Defense Department.

Along with the staff report, the subcommittee will release printed hearings of executive sessions held with Secretary of Defense Charles Wilson, Secretary of the Air Force Donald A. Quarles, and other officials on profit and contract practices.

Airpower Investigation

The plan of the special Senate Armed Services Subcommittee set up to investigate the aircraft and guided missiles programs now is to start early in April with executive sessions, followed by public hearings in Washington, and then to hold public sessions at aircraft industry centers on the West Coast and other parts of the country.

The subcommittee, headed by Sen. Stuart Symington (D.-Mo.) includes Sen. Henry Jackson (D.-Wash.), Sen. Sam Ervin (D.-N. C.), Sen. Leverett Saltonstall (R.-Mass.), and Sen. James Duff (R.-Pa.).

Fowler Hamilton, 45, the counsel for the subcommittee, has been a trial lawyer for the past 10 years with the New York firm of Cleary, Gottlieb, Friendly and Hamilton. Born in Missouri, he was graduated from the University of Missouri, attended Oxford University as a Rhodes scholar, and subsequently practiced law in Kansas City as a member of the firm of Watson, Ess, Marchall and Enggas, until 1938.

As a Special Assistant to the U. S. Attorney General, he dealt in anti-trust cases and later became head of the Justice Department's war frauds section. In 1942, Hamilton became chief of the enemy branch of the Foreign Economic Administration with the responsibility for evaluating the economic and industrial strength of Germany and Japan.

In 1943-44 he served on the staff of Lt. Gen. George Stratemeyer, then commanding general of Army Air Forces in the China-Burma theatre. He again served briefly as an assistant to the Attorney General on anti-trust matters before joining the New York law firm in 1946.

Renegotiation Approved

Renegotiation was given a pat on the back by the House Appropriations Committee. In approving Renegotiation Board's coming-year budget, the committee declared that "the work of the Board continues to be effective as evidenced by the total determinations of excess profit before federal tax credit of in excess of $380 million to date."

Celler Politicking

Sessions of the House Judiciary Subcommittee looking into monopolistic practices in air transportation are marked by sharp clashes between Chairman Emanuel Celler (D.-N. Y.) and Rep. Kenneth Keating (R.-N. Y.), ranking Republican.

In launching into a probe of the relationship between Civil Aeronautics Board and Air Transport Assn., Keating charged, Celler "is going far afield" and having a "political field day." He was cut off by a bang of Celler's gavel. The numerous operations of ATA and airlines exempted from the anti-trust statutes certainly do dictate review by the judiciary subcommittee, Chairman Cellar maintained.

Traffic Controllers' Society

Plans have been laid for organization of a national professional society of air traffic controllers. A sponsoring group in Washington has drafted a proposed constitution and by-laws to be presented at an organizational meeting. Society will be called the Air Traffic Control Association. Clifford P. Burton is acting executive director.

Objectives will be to promote, maintain, and enhance the stature of the air traffic control profession; to develop and disseminate knowledge of the control of air traffic; and gain greater acceptance and recognition as a profession.

Membership will be drawn from Civil Aeronautics Administration and military personnel who are either actively engaged in the field or demonstrate a continuing interest in the field of air traffic control.

Powerplants

Watch for renewed effort to speed powerplant development if Dr. Clifford C. Furnas remains in his position as Assistant Secretary of Defense for Research & Development. He told a recent Cleveland meeting of the Institute of Aeronautical Sciences that powerplant design is lagging far behind airframe design, as contrasted to eight or ten years ago. And, he said, "these relative positions in the scale of progress should be reversed." The reason: new propulsion ideas are essential to help solve the VTOL and STOL problems.

New D.C. Airport

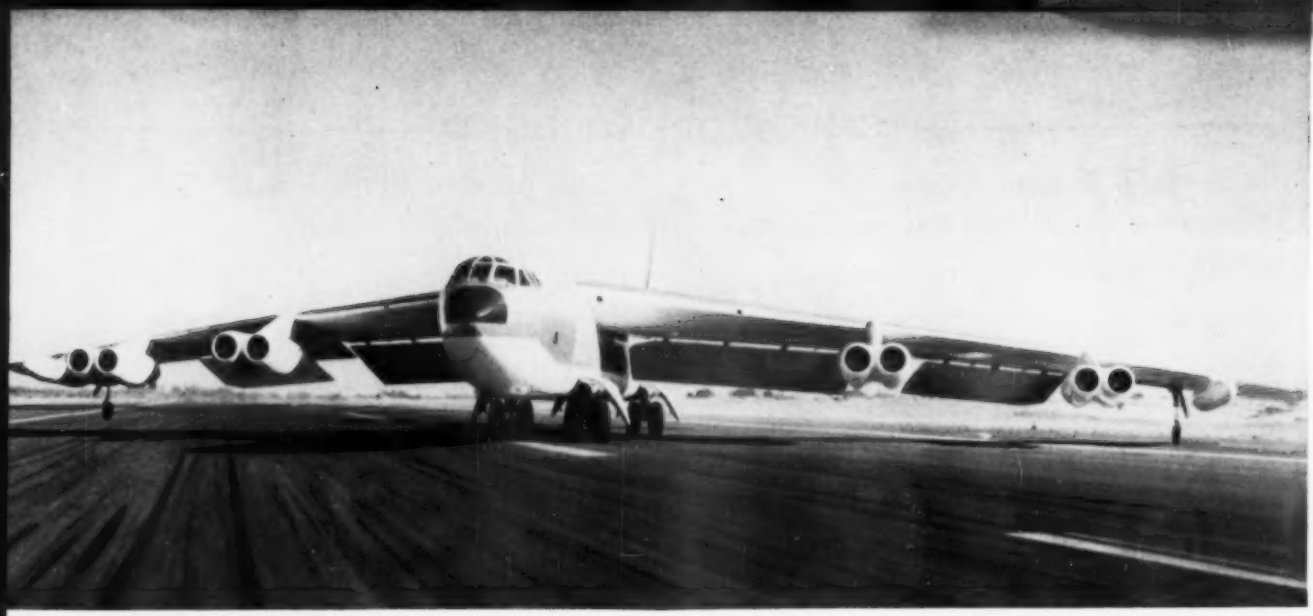
Senate Commerce Committee has put off for two weeks action on a report directing Commerce Department to construct a second airport for the nation's capital at Burke, Va., and have it finished in two and a half years.

Over the protests of Sen. Mike Monroney (D.-Okla.), the committee went along with the request of Maryland's Sen. John Butler (R.) to give him additional time to develop information supporting the use of Baltimore's Friendship as the alternative Washington airport, instead of constructing a new one. Over the past five years the Maryland delegation has led in killing off plans for the airport at Burke.

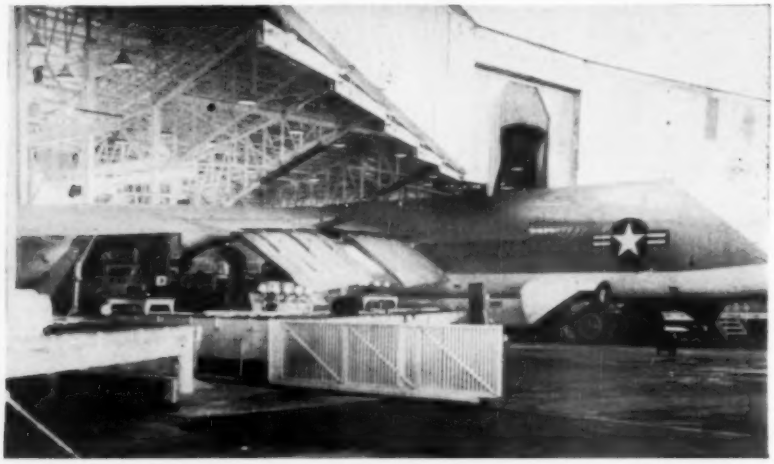
Dispersal Complaint

New complaint against dispersal of new aircraft and missile plants is being emphasized by labor unions. International Association of Machinists says dispersal is sending some firms to low-wage areas and charges that they are trying to establish pay rates below industry pattern.

—Washington staff



CROSSWIND LANDING GEAR carries Stratofortress down runway at sharp angle, gives pilot trainee feeling he is traveling sidewise.



B-52, note wing-flap size, undergoes flight-line maintenance in Castle AFB nose dock.

THESE NOSE DOCKS can be disassembled for air transport, cost $170,000 each.

B-52 Gives

Strategic Air Command

By Richard Sweeney

Castle Air Force Base, Merced, Calif.—Boeing's B-52 Stratofortress, the long-sought-for B-36 replacement designed to push the USAF's intercontinental capability into the jet age, is slowly being phased into Strategic Air Command operations here, bringing with it more power and, at the same time, greater problems in the areas of manpower, maintenance, training and operations.

Crewmembers learning to handle the giant, eight-jet bomber at this base in California's San Joaquin Valley are generally enthusiastic. The $8-million B-52, they say, is being delivered with fewer bugs and more built-in operational capability than they've ever seen before.

Crew Problem

But SAC's problems begin with the crews themselves:

• **How best to train them** when each flying hour costs in the neighborhood of $10,000?

• **Where to find them?** The difference between 50 aircrews for each B-52 wing and 32 for a B-36 wing creates a gap which must be filled from the crews of B-47 medium bombers. At the same time, SAC planners have to be sure that the siphoning off of B-47 crews does nothing, or as little as possible, to impair the efficiency of its medium-bomber striking force.

Thus far—the first Stratofortress was delivered to the Air Force in June—the

PILOTS SAY MC-1 partial pressure suit (left) finds best use at masquerade ball, but technicians approve of easy-to-open nacelles.

Air Force More Authority, Headaches

faces maintenance, manpower problems in Stratofortress integration.

planners and training officers have managed to put together one operational B-52 wing. A second wing has entered the training pipeline, with about half of its needed 50 crews already graduated from the training program here.

Less than 50 of the aircraft are in operational service at this particular base, but others are flying in various test programs.

Now equipped with the B-52s are the 93rd Bomb Wing (formerly a B-47 wing) commanded by Brig. Gen. William E. Eubank, Jr., and the 4017th Combat Crew Training Squadron commanded by Col. William R. Smith.

The 93rd is a combat unit, the 4017th a training organization for new B-52 crews.

The 4017th, assigned on paper to Headquarters, 15th Air Force, March AFB, Calif., is attached to the 93rd Wing, and Gen. Eubank's orders are to place the emphasis on producing new crews rather than sharpening his wing to combat status.

Training Schedule

At present, eight new B-52 crews are being graduated each month, or 96 crews (two wings) per year. Now in training is the 42nd Bomb Wing, Heavy (B-36s), from Loring AFB, Maine.

SAC trains its own B-52 crews, rather than turning the job over to the Training Command, for several reasons. They include:

• **There aren't now**, and won't be within the near future, enough B-52s to tie up a large number in training-command operations.

• **Training-squadron-attached**—to-a-combat-wing system insures training in combat planes rather than stripped down trainers.

Time counts too. SAC feels that incoming crews already know how to operate various special equipment and proceeds from there to accomplish overall development of an integrated crew for a complex weapon system.

In use at Castle are the B-52A, B-52B and RB-52B. They are aircraft which, according to the pilots, outstrip their engines in performance and reliability, and the Pratt & Whitney J57 has been operational several years in a variety of applications.

Pilots have taken the plane well over 50,000-ft., pushing to the limits of the J57, which encounters a compressor stall problem above that point.

Pilots like the aircraft's stability at low speeds. Control effectiveness, using the acrodynamic air brake system in lieu of ailerons (stub ailerons are on the plane but so small they have borderline value at best), is reported excellent at low speeds as well as high. Maneuverability, even on final approach, is above what would be expected of an aircraft this size. Pilots report the B-52 is better (more stable, more controllable, more responsive) for aerial refueling than the B-47 despite the refueling inlet's location above and behind the pilot.

The B-52, at light (return from a mission) weights, can fly the traffic pattern at the same speeds as the DC-6 and DC-7.

So far, several thousand hours have been logged in B-52s during 93rd combat training missions and 4017th transitional sorties. The Feb. 16 crash which took the lives of Col. Patrick Fleming, deputy commander of the 93rd, two instructor pilots and an instructor observer, was the first Stratofortress fatality at Castle, and steps have been taken to remedy the defect (AW March 5, p. 23) which caused the crash.

The 4017th has a 10-week course for new crews. Academics, simulator work and actual flight practice are blended to turn out, at graduation, groups of six men who can operate the B-52 weapon system in all respects safely and without instructors.

Once a crew reaches the actual flight stage, missions generally are planned on a three day cycle. One day is given over to general and specialized briefings, one day to flying it and the third for

Exclusive Report

This exclusive report on the integration of the B-52 into the Strategic Air Command was prepared by Richard Sweeney of Aviation Week's West Coast Bureau, who spent a week at Castle Air Force Base to study and report on the Stratofortress, the training program for its crews, its operational capabilities and the new problems that have arisen through its introduction.

critique and simulator work which extends over from academics into flightline work.

The flying day starts when crewmen report to the plane three hours prior to takeoff for personal equipment inspection, airplane inspection and a final huddle and briefing between instructors and students. The flight itself covers another eight hours and more.

Such a flight usually follows this pattern:

- **Takeoff and climb** to altitude. A run across the gunnery range and practice firing.
- **RBS (Radar Bomb Scoring) run** on Los Angeles, where the practice run is scored by ground radar crews at Cheli Air Force Depot.
- **Navigation leg is flown,** with both observers taking part. Day or night, one observer works celestial navigation while the other simultaneously works a radar navigation problem.
- **Air refueling.**

The aircraft then returns to the San Joaquin Valley local flying area where instrument flying is practiced, followed by ILS and GCA approaches. During all this time, electronic counter-measure practice and theoretical gunnery has been in progress.

Pilots then generally shoot transition touch-and-go landings until the final landing is accomplished and the airplane buttoned up.

Curricula

The training program takes advantage of all possible devices to speed training, keep crews sharp after they leave the 4017th and enable them to reach "combat ready" status within their own units as quickly as possible.

Based on the cornerstone of the 4017th's academic, flight and simulator curricula, it is presently estimated crews will be five-and-a-half to eight months in the pipeline between assignment to the 4017th and designation as "combat" ready.

To accomplish its training mission, the 4017th gives pilots 192 hrs. of academics; observers 182 hrs.; electronic counter measure (ECM) crewmen 176 hrs., and gunners 155 hrs.

The academics span six weeks, the flight work four. At five weeks, all crewmen start work in simulators, with each crewman making about three "flights" in his trainer before actual B-52 flight.

There is no absolute rule on the number of simulator flights for trainees; proficiency is the criteria. The same standard applies to training sorties. Some crews may need more than the usual five missions of seven hours, 20 min. each. Others may be proficient after four.

In the academic ground school, extensive use is made of mockups provided by the Mobile Training Detachment.

There are, in one building, $900,000 worth of mockups of B-52 flight controls, hydraulics, pneumatics, fuel system, electrical, air conditioning, an autopilot and ejection seat.

The investment has paid off, not only for aircrews, but also for maintenance and specialist classes.

Last year, 360 maintenance men went through the mockup indoctrination in 24 classes of 15 men each. Eighty-eight aircrews have been put through it, and 32 specialists went through in January and February of this year alone. The mockup unit puts in about 8,000 student man-hours per month.

Each crew member is given a general knowledge of the airplane's systems. A thorough knowledge is imparted in the system pertaining to his crew duty, but the overall airplane is not neglected.

Subjects Covered

Subjects covered and time spent on them in academics are:

- **Pilots,** B-52 systems, 92 hrs.; airplane performance (fuel consumption, mission planning, etc.), 45 hrs.; air refueling, six hrs.; instrument flying, 11 hrs.; weather (high altitude), six hrs.; electronics, eight hrs.; personal equipment, two hrs.; strange field procedures, two hrs.; communications, five hrs.; emergency procedures, eight hrs.; a questionnaire covering these subjects, three hrs.
- **Observers,** B-52 systems, 27 hrs.; performance, 23 hrs.; radar bombing, 91 hrs.; bombing and navigation, 15 hrs.; weather, eight hrs.; personal equipment, two hrs.; strange field procedures, two hrs.; communications, three hrs.; emergency procedures, four hrs., and questionnaire, three hrs.
- **Gunners,** B-52 systems, 27 hrs.; defensive armament, 110 hrs.; communications, three hrs.; personal equipment, two hrs.; strange field procedures, two hrs.; emergency procedures, four hrs.; questionnaire, three hrs.
- **ECM crewmen,** B-52 systems, 27 hrs.; equipment familiarization, 44 hrs.; operational procedures, 52 hrs.; communications, 11 hrs.; celestial familiarization, 11 hrs.; personal equipment, two hrs.; strange field procedures, two hrs.; emergency procedures, four hrs.; questionnaire, three hrs.

Crosswind Landings

In all cases, the questionnaires are not for school-type grading. They have been devised and revised to indicate where remedial action will be necessary on the flight line to erase deficiencies and boost crewmen to 4017th standards when training is completed.

In the four-week flying portion of the training span, five missions are programmed, with more activity scheduled for each seven hours, 20 min. flight than possibly can be accomplished. This insures no waste time aloft with the operationally-costly B-52. Should one training phase abort, another can be substituted for the crewmen affected by the abort.

During flight training, pilots shoot about 35 landings at various weights. Copilots get 11 landings. There are seven GCA practice approaches and two ILS approaches.

In addition, a checkout in the use of the crosswind gear is given, which sometimes shakes up pilots at first when they look out slantwise and feel the airplane is going straight. The crosswind gear swivels 20 deg. each direction on all four main gears.

Each sortie is flown under the direction of an instructor pilot, observer, ECM man and gunner. These crewmen have completed graduate work in addition to the regular course.

In its training program SAC has received help from ARDC's personnel problem specialists in the Air Force Personnel and Training Research Center, AFPTRC. This command has established a field unit at Castle with three objectives:

- **To offer assistance** to the training unit on a day-to-day basis.
- **Perform short- and long-range** research on crew training for the B-52.
- **Perform basic training research** cutting across airplanes in general (including future types) and the crew requirements for them.

Directing the field unit is Irving K. Cohen, a civilian psychologist. In addition, there are four research psychologists and one educational specialist.

Their problem is to find ways and means to accurately assess how much of his schooling a B-52 crew member absorbs, how much he retains six months later, a year later, etc.

'Pinball Machine'

It also is their job to determine ways of increasing knowledge retention. They try to find the best ways to teach the required subjects in ground school, what subjects should be covered in academics and how deeply into the subject matter instruction can go before learning drops off from overloading of student capacities to learn and retain.

They determine two more important facts—the relationship between repetition of a subject and the spacing between repetition.

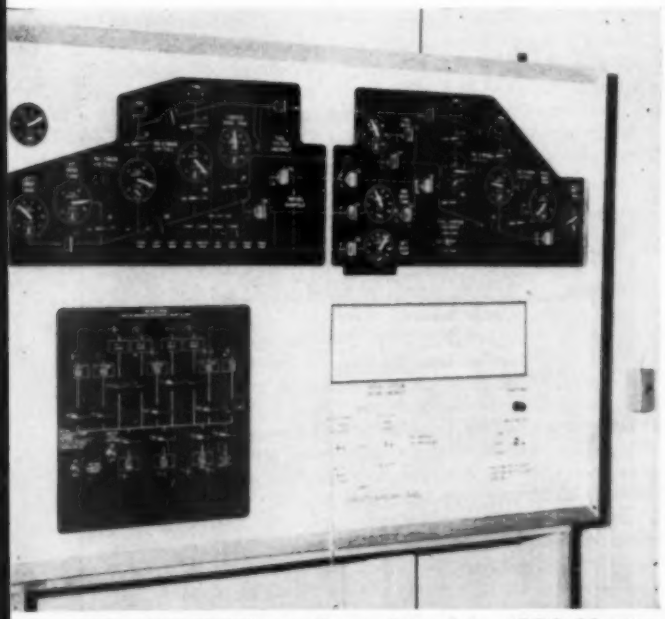
One of their projects culminated in development of a "pinball machine," a B-52 question and answer game. A wide variety of questions can be fed into the machine, and frequent changes of the questions keeps interest high and blocks mere parroting from memory by pilots playing the machine.

Fuel system management procedures on the B-52 are critical. To develop

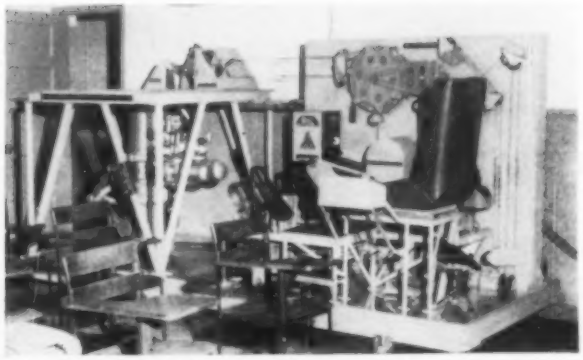
B-52 COCKPIT simulator is accurate to last detail. Crew members begin here and come back continually throughout training period.

Simulators Ease Training

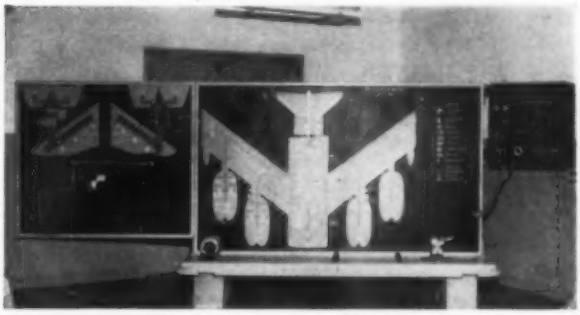
With the cost of a B-52 flying hour somewhere in the neighborhood of $10,000, Strategic Air Command planners have turned to simulators to carry prospective Stratofortress crewmembers through a major share of their training. Simulators include those for the cockpit, flight-control system, hydraulics, air conditioning and pressure system, landing gear and fuel management.



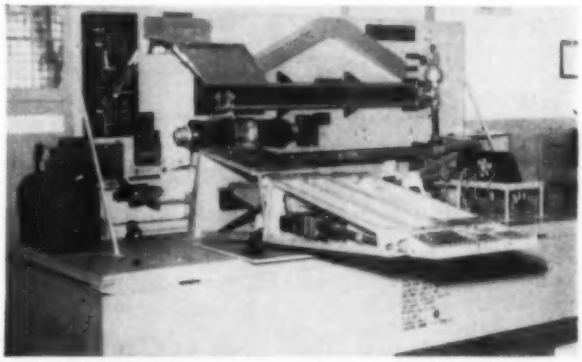
FUEL-MANAGEMENT board was designed by ARDC laboratory.



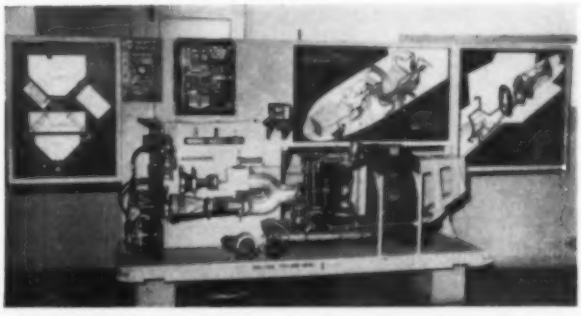
LANDING-GEAR section shows how crosswind gear operates.



MOCKUP is used to familiarize crew with hydraulics system.



FLIGHT-CONTROLS board is used extensively in pilot training.



AIR-CONDITIONING, pressure system is shown in mockup.

skill in this, a mockup board closely resembling the copilot's fuel board was built in the operations building, where pilots can practice fuel management where the presentation is realistic.

Others contributing to the daily B-52 operations are the Operational Engineering Section's human factors unit and mechanical engineering squad.

The mechanical personnel's task is debugging the airplane-in-being, sending through to SAC, WADC, ARDC and Boeing recommendations for eliminating today's bugs and future trouble spots which show through operational use of the airplane at wing strength.

Their work is similar to that of Edwards and Eglin AFB's, and Holloman AFB. Each of these locations tests a part of the weapon system as an individual unit and, to a certain extent, its effect on the entire weapon system.

Many more troubles spring up, however, in mass operational use of the entire weapon system when each crew member involved has other things to think of than just the functioning of his bit of equipment.

It was to overcome these field bugs that SAC requested ARDC to set up a field unit at Castle.

To effect quick action on remedial steps, the unit can and does cut across red tape, getting the needed article into mass prototype use in the wing while the paperwork still is going through channels.

This unit probably will have to perform the tests certifying the J57 for 1,000 hrs. between changes instead of the current 500 hrs. This time change will be made soon.

It also has recommended designs for incorporation into the new Hammond trailer, which should greatly facilitate removal and reinstallation of B-52 engines.

Development of maintenance techniques for Air Force use on the B-52 is another responsibility it carries. The current maintenance situation, unit spokesmen say, is good but could be much better.

A 100-hr. inspection now takes 8 to 10 days, which could be reduced 30 to 40% if the Air Force had more maintenance technicians. Between 10 and 15 100-hr. inspections are performed each month at the base now, and this will increase as more B-52s are delivered to Castle.

In one current maintenance situation, the unit had to devise repair techniques involving bonded metal, something new to the Air Force on these airplanes. Structures failures from supersonic vibration, caused by local area supersonic airflow was being encountered. The structure involved metal-to-metal bonds, and such procedures formerly had been handled by the Boeing factory.

McNarney Tells Profits Probe Background of Convair Position

By Katherine Johnsen

Washington—The engagement of Gen. Joseph T. McNarney, a top advocate of the controversial B-36 bomber program, as president of Convair, the manufacturer of the plane, shortly after his retirement from the Air Force highlighted hearings of the House Armed Services Investigating Subcommittee.

The subcommittee has completed public testimony from the 12 major airframe manufacturers. This week sessions are scheduled with representatives of the Air Force, Navy, and Renegotiation Board on the cost allowance and profit policies on military aircraft contracts.

McNarney retired from the Air Force on Jan. 31, 1952. He became a director of Convair on Mar. 3, and president on Apr. 1 of that year. McNarney said he contacted Floyd Odlum, chairman of the Atlas Corp. which at that time controlled Consolidated Vultee Corp. (the predecessor of Convair), at the request of Sen. Stuart Symington (D.-Mo.), who was then a private citizen. Symington was Secretary of the Air Force during the "revolt of the admirals" against the B-36 program.

McNarney's contract with Convair calls for a salary of $75,000 a year for five years, plus an escalator clause for increased cost of living. In addition, it provides for a subsequent consultant fee of $30,000 a year for a period of 10 years.

Should he die during this time, his estate would receive $5,000 a year. In 1954, by mutual agreement, McNarney's salary was reduced to $62,500, and the remainder added to the consultant contract for more favorable income tax treatment. Over and above salary, McNarney was paid a $25,000 bonus in 1954 and a $30,000 bonus in 1955. His total earnings from Convair from Apr. 1, 1952, through 1955 were $324,590.

Subcommittee questioning of McNarney centered on two points:

- **His prominent role** in support of the B-36 program as chief of the Air Materiel Command. McNarney said that he was "consistently favorable" to the program while in the Air Force.
- **Whether, as chairman** of the Defense Management Committee to former Secretary of Defense Louis Johnson, he participated in the decisions to cancel the first of the Navy's super-carriers, the United States, and to reduce the defense budget to $13 billion. McNarney reported that he knew nothing of the cancellation of the carrier contract until it was an accomplished fact and that his position was "hatchet man" to execute Johnson's policies, not to participate in making them.

Following is a report of some of the discussion on these points. Rep. Edward Hebert (D.-La.), chairman of the subcommittee, handled most of the questioning of McNarney.

Hebert: "Am I to understand, General, that you immediately upon your retirement, on Jan. 31, 1952, became the president of Consolidated?"

McNarney: "No sir, that is not correct. I retired on Jan. 31, 1952. I proceeded to San Diego. I married a San Diego girl. . . .

"At that time, I thought that I still had about five good years in me and I was willing to go to work. . . .

"On the morning of my retirement, I did receive a cryptic telephone call, and the question asked of me was, 'Have you signed up with anybody to go to work?' I said, 'I have not.' I stated at

New Missile Names

USAF's second intercontinental ballistic missile is called Titan and the USAF intermediate-range ballistic missile is named Thor.

The two-stage Titan, to be developed by the Martin Co. in its new Denver, Colo. plant, has a different configuration than the first Air Force ICBM project, the Atlas, but will use essentially the same components. Atlas is being developed by Convair Division of General Dynamics Corp. in San Diego, Calif.

Single-stage Thor, being developed by Douglas Aircraft Co. at Santa Monica, Calif. (AW Feb. 27, p. 34), will have these sub-systems contractors: General Electric Co. for the nose cone; North American Aviation Inc., propulsion; A. C. Sparkplug Division of General Motors Corp. for guidance. All major components for the Thor will be derived from ICBM weapon systems.

The plan to use same components in Atlas and Titan enables USAF to conduct different technical approaches simultaneously, at an estimated increase of only 10% over the cost of development of a single configuration. In all major performance characteristics, the two missiles are identical.

Britain Takes Over Speed Record

Great Britain, a gloomy land so far as new aircraft are concerned, received a morale booster last week with the announcement that a Fairey Delta 2 (above) has established a world speed record of 1,132 mph. in two passes over a nine-mile course at 38,000 ft. Pilot for the flight, which broke the 824.05 mph. record set by a USAF F-100 last year, was Fairey test pilot Peter Twiss.

that time that I would like to go to work but that I had two requirements: one, the job had to be in Southern California, and the other had to be that I had to respect the man I was working for. The answer was, 'Well, when you get to San Diego, would you call this number?' It was an Indio number. Not being too dumb, I could pretty well determine . . . who was calling."

Hebert: "Who called you, general?"

McNarney: "If you wish me to identify him, it was Sen. Symington."

Hebert: "Sen. Symington was speaking for Consolidated?"

McNarney: "No. He was speaking—as I understand it Mr. Symington had been out in California. He had seen Mr. Odlum. He had seen in the paper the day before that I was retiring. He asked Mr. Odlum if he knew I was retiring and Mr. Odlum said 'No.'

"I actually called Mr. Odlum two days after I arrived in San Diego. He asked if he could come up and see me the next day. He did. We had lunch. We discussed the question. He asked me if I was interested in the job. I said, 'Yes, but I would like to make a few examinations before I accept.' I then contacted the head of an engineering firm who was working for Consolidated, whom I knew, one of the Heller associates. I asked him up to my apartment. I questioned him very closely on everything that was going on at Convair.

"I then, based on what he told me, asked four different individuals working in Convair to come out and see me . . . and five days later I made up my mind it was a job that I could take.

"I then called Mr. Odlum . . . and we came to terms."

Hebert: "You had no part in the cancellation (of the supercarrier)?"

McNarney: "No part at all."

Hebert: "Would you say there was any connection between the B-36 program and the cancellation of the United States?"

McNarney: "I have no knowledge of anything that could tie the two things together."

Hebert: "Except that in some quarters it was said that the controversy arose over the conflict between the Navy and Air Force as to strategic bombing."

McNarney: "I know nothing about that."

Hebert: ". . . Your consistent appearance in the front ranks of those advocating the continuation of the controversial B-36 contract with Consolidated had nothing to do with the almost immediate employment by the Consolidated company?"

McNarney: "That is correct."

Hebert: "Did you at any time ever consider that perhaps such a connection, an almost immediate connection would place you in suspect?"

McNarney: "No, I never considered that. I felt that my reputation . . . was such that a thing like that would never be charged against me.

Hebert: "In other words you have a most high opinion of the reaction of the American public opinion.

McNarney: "Yes . . ."

Hebert: "As a military man with a brilliant career, did you at any time indicate to Secretary Johnson the dangers to this country in case of an eventuality of operating on such a reduced budget?"

McNarney: "The evaluation of what that reduction would do to the armed forces was the job of the Joint Chiefs of Staff. . . ."

Hebert: "Didn't you at any time consider it your duty as an American citizen . . . to voice your opinion for the safety of your country? . . ."

McNarney: "I was doing my job as I saw it at the time."

Hebert: "And you, with your keen sense of duty . . . did not feel that it justified an expression, even voluntary, on your part when the defense of this country was at stake?"

McNarney: "I always express my opinion on anything for which I have any responsibility whatsoever."

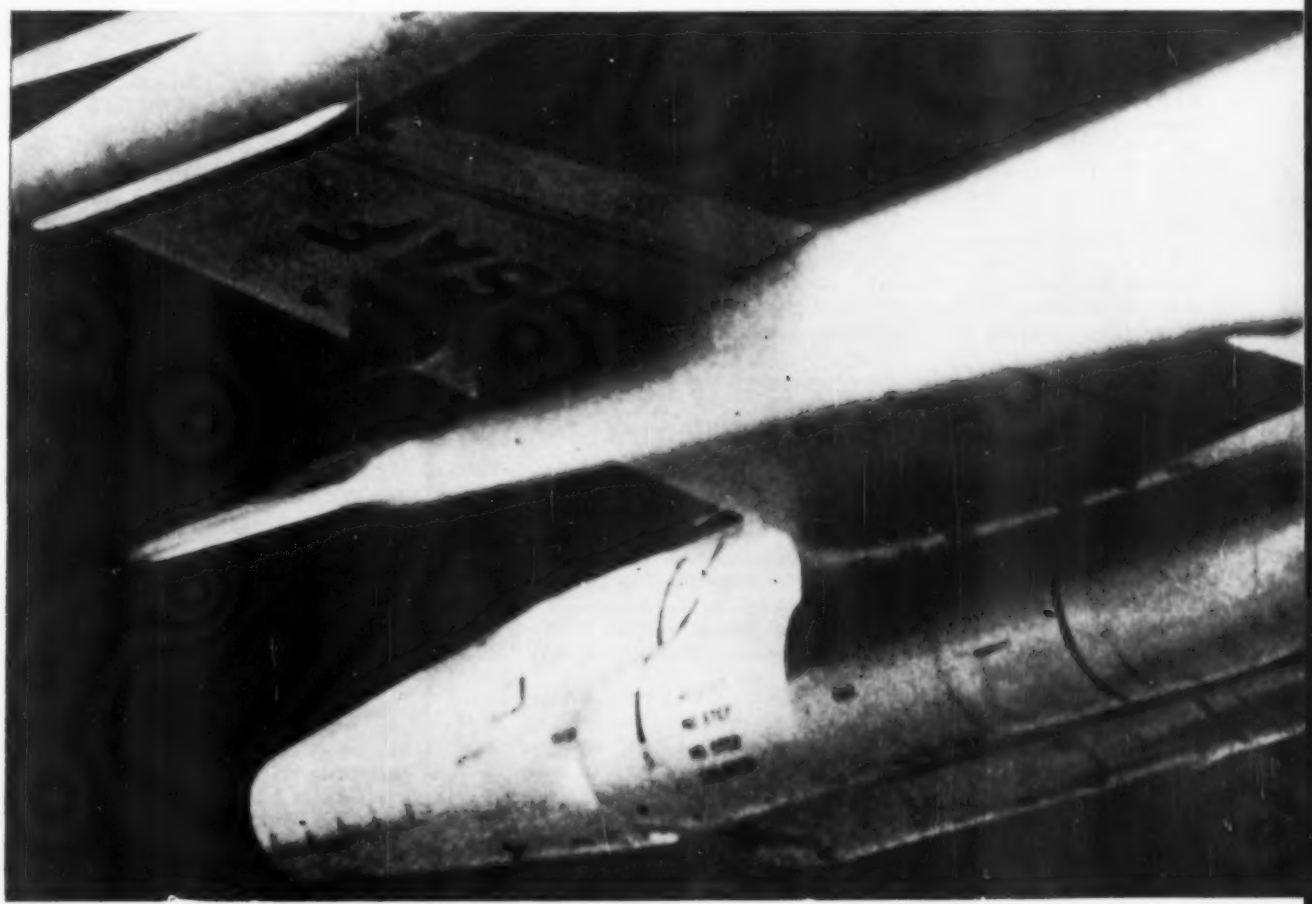
Hebert: "We are getting nowhere fast. But I think your replies will indicate exactly what you have said. And I can understand now how you saw nothing wrong or did not think anybody else would see anything wrong in your taking employment with a company like Consolidated in view of the previous happenings in connection with the B-36. Such naiveness is refreshing, but I don't think practical."

National Air Show

The 1956 National Aircraft Show will be held Sept. 1-3 at Will Rogers Field in Oklahoma City, Okla. Although full participation by all branches of the armed services is expected, they are not yet revealing any details. President of the show is Frederick C. Crawford.

New Scorpion Designed for Falcon

Northrop Aircraft, Inc., last week unveiled its new F-89H Scorpion (above and at left below), first operational aircraft to carry Hughes Falcon air-to-air guided missiles as part of its standard equipment. In each of its wingtip pods, the F-89H carries three Falcons plus a packet of folding-fin, non-guided rockets. When ready for firing, below left, the Falcon missiles are extended from the sides of the pods for launching. The test program included Falcon firings from both wing pods and pylons (below and left above).



Congressmen to Visit Atomic-Age Navy

By Claude Witze

Guantanamo Bay, Cuba—More than 100 members of Congress, about to pass judgment on U. S. Navy's 1957 budget requests, will visit here this week for their first realistic appraisal of a seagoing task force designed for the age of nuclear warfare.

If they turn out to be critical it is unlikely that they can find fault with fleet operations or the design and construction of the hardware and electronic wonders that guard the task force and make it potent. It is possible that they will weigh the performance of the Bureau of Aeronautics and the aircraft industry, as already indicated in a report of the House Government Operations Committee. (AW Mar. 12, p. 341).

A press preview last week made it clear that Navy aircraft development has not kept pace with the technological advances that have gone into supporting elements of a modern fleet or task force.

Prototype Force

In the prototype force now at Guantanamo, the new USS Forrestal is accompanied by some ships and defensive weapon systems as up-to-date as the carrier itself. Ready for action, the Forrestal alone represents an expenditure of close to $300 million. Sailing with it are these investments:

- **USS Boston,** first guided missile cruiser, equipped with the Convair Terrier anti-aircraft missile.
- **USS Northampton,** first tactical command ship, carrying advanced electronic and communications gear.
- **USS Forrest Sherman,** the Navy's fastest destroyer, built to keep pace with the Forrestal.

In the total force, there are 27 warships. These include the 27,000-ton carrier Antietam; three 45,000-ton battleships, the New Jersey, Iowa and Wisconsin; two heavy cruisers, the Salem and Des Moines; 15 destroyers and two submarines.

Admiral Arleigh A. Burke, Chief of Naval Operations, will tell the Congressmen he is looking forward to the day when the Navy will have, after this pattern, task forces that include as many as three or four carriers and six missile-firing cruisers.

He will emphasize other new projects already disclosed and discussed at closed hearings in the past month on Capitol Hill. These include:

- **Tartar,** another Convair anti-aircraft missile, smaller than Terrier and proportionately more powerful. Like the Terrier, it was developed at Johns Hopkins University's Applied Physics Laboratory. It will replace five-inch guns on eight destroyers being sought in the Fiscal 1957 budget.
- **An increase** of "dozens" in the missile-firing cruiser fleet. In addition to the Boston, the USS Canberra is slated for operation before the end of this year. Adm. Burke feels that further conversions of old-style cruisers will grow uneconomical and that they must be built from the keel up. In the 1957 budget, five more conversions will be sought and this type of program will continue for three to four years.
- **Day fighter planes** are on the way out and must be replaced by aircraft with all-weather capability. Best bet at present is the McDonnell F3H-2N Demon, one of the planes that should be on the Forrestal today instead of its older sister, the F2H Banshee. First deliveries of Chance-Vought's promising F8U Crusader, 1,000-mile-an-hour fighter, due with the fleet in 1957, will have no all-weather capability. It is anticipated it will get this capability later at some sacrifice in performance. The Douglas F4D Skyray, like the Demon, has been delayed, along with the F8U.
- **The unfinished** battleship Kentucky may be completed with guided missile capabilities. Weapons would include ballistic missiles in addition to guided missiles of the Regulus type and anti-aircraft protection. The ballistic missile is described as one with "long-range" capability. If the Navy decides to press this project, funds probably will be sought in the Fiscal 1958 budget.

Sharpest and most spectacular contrast to the aircraft situation will be found in the Boston's demonstration of its capabilities with the Terrier.

Rear Adm. John H. Sides, who has been working on guided missiles since 1948, stresses the importance of weapons designed for shipboard use. In a defense of segregated missile development projects, he pointed out that the seagoing environment, with its "limited real estate," stringent safety requirements and isolated maintenance facilities make it essential that the system be built for this specific purpose.

Victory for Furnas

Washington—Battle over control of weapons development has ended in "a clean victory" for Dr. Clifford C. Furnas, Assistant Secretary of Defense for Research and Development, some supporters of Dr. Furnas say.

Although other backers still are somewhat skeptical, Defense Secretary Charles E. Wilson's remarks at a press conference last week bore out the "clean victory" point of view. Wilson said again that he acted too hastily in issuing a Feb. 21 memorandum which appeared to shift responsibility for development from Dr. Furnas' office to that of Frank D. Newbury, Assistant Secretary for Applications Engineering, without first "selling" Dr. Furnas on his reasons for it. (AW Mar. 5, p. 27 and Mar. 12, p. 338).

Dr. Furnas delayed a trip on Mar. 5 in order to talk to Wilson. A source close to Dr. Furnas said that is the only personal discussion they have had on the issue.

Meanwhile, Wilson's office is "studying and perplexing along" on how to cancel the effect of the Feb. 21 memorandum—whether to withdraw it, issue another memo superseding it or ignore it.

Cessna Introduces New Model 182

A new concept for introducing business aircraft to prospective buyers will be tested by Cessna Aircraft Co. this month in its display of the four-place Model 182.

The plan involves a three-day showing at each Cessna distributor in the U.S. and Canada. At each showing, Cessna will invite the general public as well as tried customers and good prospects and offer, as part of the attraction, free airplane rides, to passengers chosen by lot.

Through such a venture, the company hopes to get across the light business aircraft story to the man in the street—a segment largely ignored in recent years.

The latest airplane to join the Cessna line, the 182 is a tricycle landing gear version of the 180—and with the lighter 172 marks the company's complete transition to this easier-to-fly configuration.

Initial deliveries to customers will begin concurrently with the 182 sales displays. Some 45 of the aircraft were built in February.

Priced at $13,750, the 182 is powered by a 230-hp. Continental 0470-L and has a cruise speed at 70% power of over 158 mph. at 7,500 ft. Top speed exceeds 160 mph; sea level rate of climb is 1,100 fpm. Cruise endurance is 4.5 hr.

FOR 3000 PSI PNEUMATIC SYSTEMS

SOLENOID VALVES
REGULATORS
INTERLOCK VALVES

Stratos' Western Branch now is turning out solenoid valves and pressure regulators for 3000 psi pneumatic systems. Light, reliable, precision-built, they complement the large group of Stratos pneumatic equipment for aircraft.

Model 7008 solenoid valve assembly

Exploded view of Model 7006 solenoid valve core, assembly and body

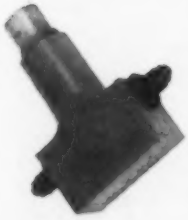
Model 7009 solenoid valve core

Photos not to scale

Solenoid valves are made in two types, each produced as: normally closed, normally open, and normally closed with manual override. Designed for continuous duty in aircraft pneumatic systems, Stratos 3000 psi solenoid valves are compact, light, and simple to install. Drawing less than 1 amp, they are fast acting (0.020 sec.) and their reliable performance remains unaffected by temperatures of −65°F to over 165°F.

Flow capacities are equivalent to a 0.040" sharp edge orifice for the direct-operated size and to 0.312" for the larger air relay type. The solenoid of the smaller model is used in the higher-flow air relay unit.

Both types are available as either complete units—or as core and seat assemblies which can be threaded into housings integral with the mechanism to be controlled.

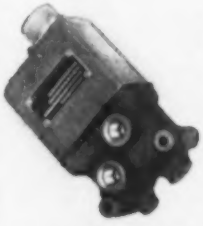


Model 7002 pressure regulator

Pneumatic Pressure Regulators by Stratos provide a wide range of adjustable downstream pressures and are designed to operate with 3000 psi supply.

The high flow model, with a flow capacity equivalent to a .115 diameter sharp edge orifice, can be adjusted to downstream pressures from 400 to 1500 psi. Downstream proof on this pilot operated unit is 5000 psi.

The poppet-type, medium flow regulator illustrated delivers a capacity equivalent to a .035 diameter sharp edge orifice, adjustable downstream pressures range from 100 to 800 psi., proof pressure is 1500 psi.



INTERLOCK VALVE
pneumatic/electric

Pressure:
Rated 400 to 1500 psi.
Proof 3000 psi.
Burst 4000 psi.

Control: Mechanical. Interlock switch rating at 30 V dc or 250 V ac is 10 amps.

Weight: 1.2 pounds

Ambient temperature range: −60°F to 165°F.

Provides pneumatic and electrical interlock to prevent premature energization of devices in series with actuator of interlock valve.

For more complete data on Stratos' 3000 psi solenoid valves and pressure regulators, write to: Stratos' Western Branch: 1800 Rosecrans Avenue, Manhattan Beach, California

Stratos Western Branch also makes:

ACTUATORS · COMPRESSORS · EJECTORS · CONTROLS

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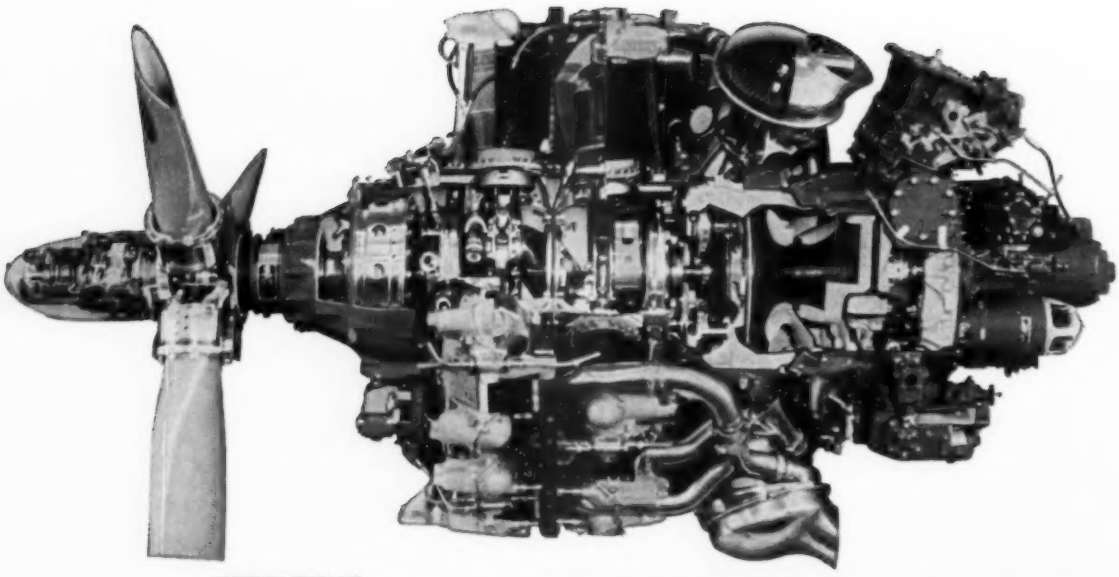
A DIVISION OF FAIRCHILD ENGINE & AIRPLANE CORPORATION

Main Plant: Bay Shore, L.I., N.Y. Western Branch: 1800 Rosecrans Ave., Manhattan Beach, Calif. West Coast Office: 1355 Westwood Blvd., Los Angeles, Calif.

Accessory systems and precision equipment for aircraft

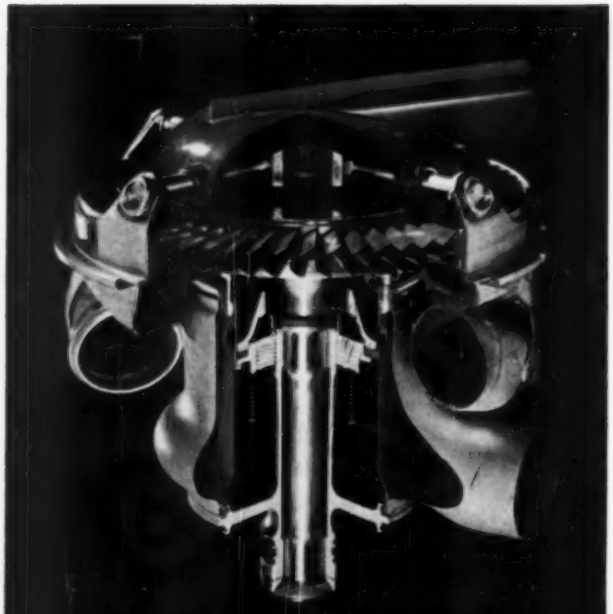


CURTISS-WRIGHT
Turbo Compound Engines are in use by 30 World Airlines plus leading military aircraft

Kelsey-Hayes helps put 20% power bonus into Curtiss-Wright engines

One more example of Kelsey-Hayes diversity at work for major industries throughout America

Any way you translate it—*20% longer range, 20% less fuel, 20% more payload*—power recovery turbines on the Curtiss-Wright Turbo Compound engine mean greater operating economy. The entire power recovery unit — requiring 2000 close tolerance machining operations — is manufactured to highest engineering standards by the Aviation Division of Kelsey-Hayes.



CROSS SECTION of the velocity-type, power recovery turbine unit manufactured for Curtiss-Wright by Kelsey-Hayes. The unit consumes no fuel. Exhaust gases are piped directly to the turbine and converted to usable power. There is no harmful back pressure. Effective operation is assured at all speeds and altitudes.

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HUGE USAF rocket stand shown during engine test is similar to those being built by Aerojet near Sacramento. Note length of flame.

Aerojet Builds New Missile Rocket Plant

Sacramento, Calif.—Giant rocket engine test stands capable of handling thrusts up to 1.5 million lb. are near completion in the isolated hills 12 miles east of here.

Testing already has begun at the closely-guarded site. The test facility is part of what will be the nation's largest rocket engine plant, planned by Aerojet-General Corp.

Two of the great concrete stands are now in use. They are capable of handling 300,000 lb. loads. Three more stands are under construction. One is designed for 1.5-million lb. loads and will be capable of handling the thrust output of the largest rocket engines now on the drawing boards. This will be ready by the end of the year.

A $9-million solid propellant plant on the 14,000 acre site is manufacturing Rato rockets and associated products for the Navy. Aerojet now is committing an additional $35 million for the liquid rocket facility. Vice President and General Manager William E. Zisch says several million of this already is invested in the test operation.

Larger Facility Planned

While the test stands are the most dramatic sight at the facility, they are only a part of a sprawling plant which Aerojet hopes will become one of the giants of the missile engine business.

The stands rise along the face of a 40 ft. ravine on the eastern edge of the property. The four stands will have multi-firing positions. Three additional stands with seven firing positions are in the planning stage.

These are so-called "close return" stands which deflect the roaring exhausts of huge rocket engines at a 90 degree angle by means of a water-cooled deflector plate. This method was used by the Germans in World War II.

While construction still is underway, firings at the site have been in the horizontal position. This accounts for much of the noise and flame reported by Sacramento area residents during 150,000-lb. night firings.

Vertical mounting of the rocket engines will produce less noise and flame at the same power.

C-Clamp Tests Stands

The stands themselves are of reinforced concrete with steel superstructure. They are designed in a C-clamp configuration to withstand the tremendous loads which rocket engines capable of 1.5 million lbs. thrust will put on them. There is an exceedingly high percentage of steel in the structures in order to take out these loads.

Despite the tremendous forces they must withstand, the stands—unlike those which Aerojet built for the Air Force at Leuhman Ridge at Edwards Air Force Base—are not cantilevered into the ground but depend on the C-clamp design for basic strength.

While working platforms of the smaller stands are at ground level, massive ramps are necessary for technicians to handle the big engines which will be tested on the 1.5 million lb. thrust stands. Complete engines and tankage can be tested on these structures.

The huge steel deflector plates which must bear the brunt of the rocket exhausts are more than 15 by 20 ft. in size and are bolted into the concrete so that the gas cannot pry them off. Water is sprayed into the fiery exhaust under high pressure through large nozzles mounted in a series of holes in the deflector plates.

Tunnels to Control Rooms

Underground tunnels connect each stand with its control room, providing access for personnel as well as instrumentation and control lines. There will be one control room for each two stands. These windowless bunkers are heavily banked with earth on the stand side.

There is no direct or periscope

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vision from the control rooms to the stands during firing. Closed circuit television is employed.

"We find that this does a pretty good job of indicating severe abnormalities that might necessitate a shutdown," said Robert Young, resident manager of the liquid rocket facility.

Control Rooms

The control rooms are heavily instrumented with IBM and Remington Rand equipment for taking, reducing and storing data. "The whole system has been designed around the most up-to-date methods of instrumentation and data reduction," Young said.

Size of the control rooms varies with size of the stands, due to the need for increased instrumentation on the larger thrust test stands. A few yards behind each control room is a shop building, also protected by earth bunkers. Like the control rooms, each shop building services two stands.

Fuel Storage Area

In the immediate vicinity is a storage area for liquid oxygen and further away is an above-ground propellant storage area. Fuel lines connect these to the stands.

For safety, tankage for the rocket engines under test is installed in tank rooms at the bottom of each stand and inside the structure.

In addition to the high thrust facility, Aerojet is building a low thrust test area nearby.

This so-called "coleflow" facility will be used to test pumps, components and small thrust units.

A buffer area a mile in depth surrounds the row of test stands and their supporting service buildings. The administration building for the plant is located about three miles from the test area. Near this is a 108,000 sq. ft. fabrication building, with 30% of its space devoted to component work and 70% to development and fabrication. A cafeteria in this area will serve personnel of both the solid rocket and liquid rocket plants.

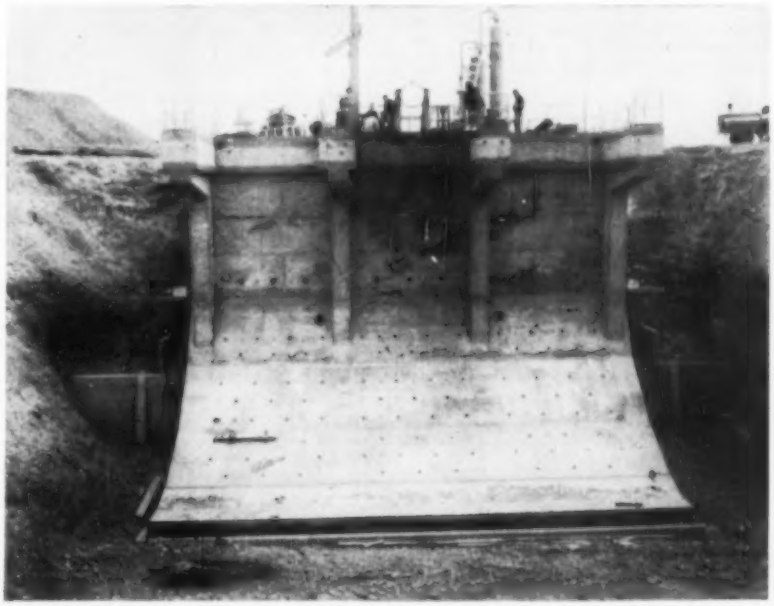
Separate Plants

In general, the liquid and solid facilities will be operated as separate plants, with a resident manager for each. Aerojet General Manager Zisch lists several reasons for this:

- **While the liquid facility** is under USAF cognizance, the solid propellant plant is under the Navy.
- **The liquid program** is "so important" that its top management must be uninterrupted by concerns with other matters.
- **The solid plant** is in production,

AERIAL VIEW of new Aerojet liquid rocket plant. Terraced hills in foreground block noise.

BUNKER-TYPE safety shelter built for Aerojet's Sacramento rocket-engine facility.



DEPRESSED TEST STAND is shown at the Aerojet-General liquid rocket plant.

How to Do Away With Lock Nuts and Lock Wiring

use **HELI-COIL*** **Screw-Lock Inserts**

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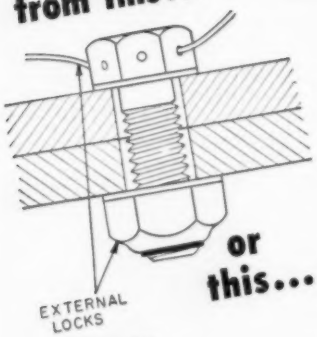

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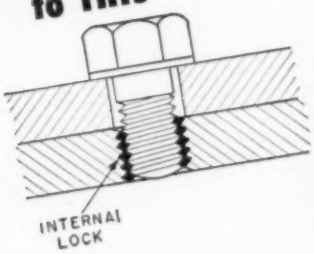

Screw-Lock Inserts meet AN-N-5b and MIL-N-25027 military specifications for lock nuts.

For years designs requiring lock nuts or lock wiring have plagued designers with problems of space, weight and costs. Each lock nut, even a small one, takes space, has weight and costs money. Every bolt locked with wire requires a through hole in the head, positioning and wiring. The simplicity of many a superior design has been lost due to these cumbersome methods of fastening.

Now for the first time good designers can do away with these "design plaguers." They can accomplish the same end results plus a saving of weight, space and money by a new revolutionary concept in fasteners—*Heli-Coil* Mid-Grip Screw-Lock Inserts. This new fastener is a stainless steel wire insert with locking threads. It can be installed easily and puts the locking effect *inside* the tapped hole—protects the tapped threads for life—and locks the mating screw or the bolt with the same torque as a lock nut. This Screw-Lock Insert not only provides a stainless steel protecting thread, locks the screw or bolt, but most important of all—eliminates the space and weight of a lock nut—the wiring necessary in lock wiring.

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while the liquid program is still in the development stage.

The plant will include engineering and eventually production facilities for liquid propellant rockets as well as the test facility. Future expansion of the solid propellant area and associated manufacturing activities also is in the planning stage.

Gold Rush Country

A flight over the plant makes it apparent why this area near California's historic Mother Lode country was chosen as a site.

Though located less than a 30 minute drive from the state capital, it is isolated. Gold dredges which once mined the area have made thousands of acres useless for farming or other agricultural purposes.

The gold dredging incidentally gave Aerojet engineers some idea of the soil structure in which they had to anchor their test stands. It was within a few miles of here that John Sutter made the discovery which started the fabulous California gold rush, and one of the last gold dredges operating in the state still rattles away in one corner of the Aerojet land.

Employment Plans

To anyone accustomed to the desert areas usually associated with rocket testing, the location is a pleasant surprise. The company's 14,000 acres are spread over lovely rolling hills dotted with scrub oak.

Aerojet expects to eventually employ 5,000 at this plant. In addition to the isolation and availability of land, a more than adequate labor pool is encouraging the firm to turn to this area for its rocket expansion.

Elmer E. Nelson, resident manager of the solid plant, says labor turnover in the area is only 1½%.

Many of those now at work on the research and development program here have been transferred from Aerojet's home plant in Azusa, near Los Angeles.

Missile Research Firm Builds New Facilities

The Aerophysics Development Corp., a Studebaker-Packard subsidiary engaged in missile research and development, will move from Santa Monica to Santa Barbara, Calif., when new facilities are completed at the latter location this fall.

Plans call for construction of a new plant consisting of a 56,120-sq. ft. engineering building and a 55,000-sq. ft. research building.

Aerophysics is engaged in development of the Dart artillery missile for the Army, a test missile for the Air Force, and various other projects for the three services and the AEC.

Britain Admits Missile Dearth; RAF Abandons Fireflash Hopes

London—Britain's Minister of Supply Reginald Maudling has finally given official recognition to the fact that England lags at least three to four years behind the U. S. in missile development and must make sweeping reforms if it hopes to catch up. Among his admissions during a defense debate in the House of Commons:

• **Royal Air Force** will not be armed with any British guided weapons until newer types are developed.

• **Fairey Fireflash** air-to-air missile (AW March 5, p. 38) can be mated to present versions of the Hawker Hunter but: "You cannot hang a guided missile on an aircraft like a candle on a Christmas tree. The two things have to be tailored together." The Hunter, he pointed out, was designed around an Avon gun installation.

• **Vickers Swift** originally was scheduled to become Britain's first missile-bearing aircraft but, due to high-altitude difficulties, will be used only for "limited purposes," i.e. low-altitude photo reconnaissance.

• **Fireflash version** of the Hunter is now in the design stage, but it will be offered for export only since later air-to-air missiles will be available to the RAF by the time it enters production.

ICBM Construction

Maudling, however, did interject one heartening revelation.

Britain, he said, has started work on its own version of an intercontinental ballistic missile. An 8,000-acre site near the Scottish border, he added, is under consideration as a location for additional facilities to aid in the ground testing of the missile.

Concerning the troubles the Hawker Hunter has encountered as an operational aircraft, Maudling told Commons that modifications of the aircraft's engines are being made to eliminate the engine surges which develop when the cannon are fired at certain altitudes. The Supply Minister said the RAF also discovered that the recoil of the cannon had begun to damage components stored in the nose. Modifications to rectify this also are under way, he said.

Aircraft Production Plans

So far as aircraft are concerned, Maudling said production of both the Handley Page Victor and the Avro Vulcan will continue on a parallel basis once the Vickers Valiant has been phased out (AW March 5, p. 38). The efficiency and capability of these two bombers, he said, will be increased within the next few years through the introduction of more-powerful engines and "new ways of baffling enemy defenses."

The government, Maudling reported, also is in the process of cancelling a number of helicopter contracts, including those for the Fairey Ultralight, the naval version of Bristol's helicopter and Hunting Percivals, in order to concentrate on further development.

For the moment, the military will rely principally upon the Saunders-Roe Skeeter.

New Tests Determine Helicopter Aptitude

Psychomotor tests are being employed to determine student aptitude at the Army Cargo Helicopter Pilot School, Ft. Rucker, Ala.

The psychomotor is one way of determining the aptitude of helicopter student pilots. It presents a dynamic problem—a moving target to chase, flashing lights to match, or simulated aircraft motion—and the student is expected to solve the problem by moving proper controls.

The unit was developed by the Army Air Corps during World War II, and has been used since by USAF for checking aptitudes of prospective pilots of fixed-wing aircraft. These Army tests are the first to be made with rotary-wing students.

Four units within the psychomotor present the problems:

• **Complex coordinator,** which lights a red light at random locations on a panel. The student must move the simulated cyclic stick and rudder pedals, first to turn on a green light, and second to move that light opposite the red one. In short order the red one goes out and reappears somewhere else.

• **Rudder controller,** which simulates the action required before a plane is airborne.

• **Rotary pursuit,** which resembles a phonograph turntable with an off-center magnetic disk. The student tries to keep a stylus on the disk while the turntable rotates.

• **Direction control,** which displays a bank of 64 lights in eight rows of eight. Switches at the base of this panel are used to match the preset pattern the student sees.

Army Aviation School hopes the psychomotor will eliminate about 50% of the washouts before they start training. Both Army and USAF officers are watching the results of the tests.

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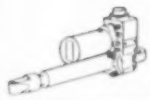

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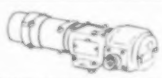

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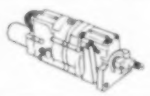

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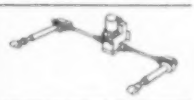

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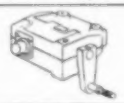

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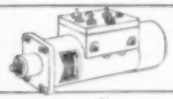

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Engine Simulator Speeds USAF Training

Chanute AFB, Ill.—The prototype of a new jet engine simulator—a major development in the USAF's urgent effort to put speed and economy into its training program for maintenance personnel—has been delivered to the Air Training Command here by Burton-Rodgers Technical Training Aids, Inc. of Cincinnati.

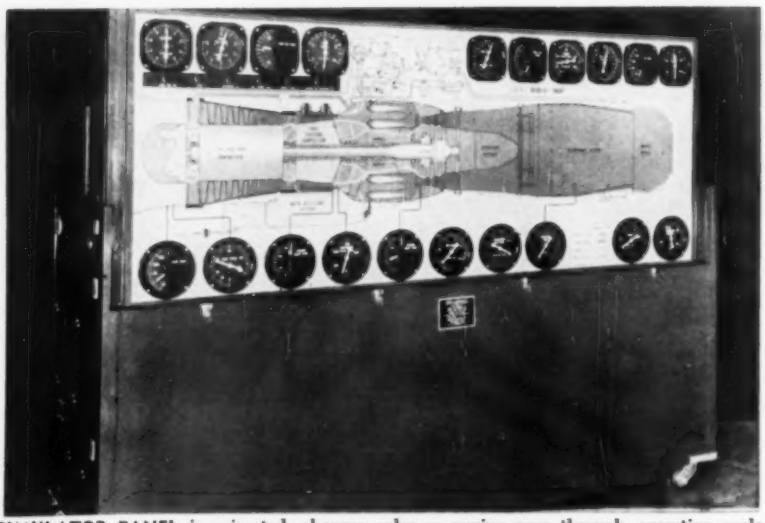
Designed to bring everything but the heat of the blast into the classroom, the Burton-Rodgers simulator reproduces the noise of the engine, the illusion of gases flowing through the compressors, burners, afterburner and exhaust and the flow of fuel.

The present USAF prototype is patterned after the Pratt & Whitney J57-P7.

This is the engine used in North American Aviation's F-100 Super Sabre, one of the Tactical Air Command's newest fighters. Combat readiness of the aircraft has been seriously hampered by the lack of qualified maintenance personnel.

The basic J57 engine also is flying in the Boeing B-52 long-range jet bomber and will see increasing service as the Convair F-102 interceptor and McDonnell F-101 Voodoo fighter are delivered to operational units.

The new Burton-Rodgers trainer is intended to help in recognition of engine malfunctions and improve trouble-shooting techniques as well as teach basic jet engine theory. It can be used to familiarize both flight personnel and maintenance workers with the engine's operation.



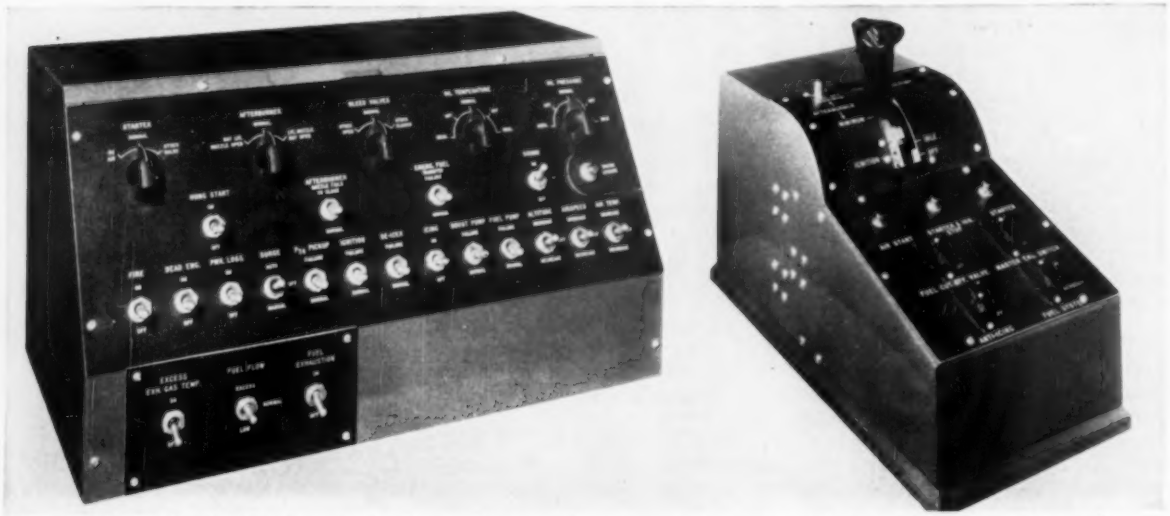
SIMULATOR PANEL is animated, changes color as engine goes through operating cycle.

At the instructor's station there are 26 switches that can be used to set up flight conditions or introduce simulated engine malfunctions, such as flameout, overheating, fire, ignition failure, fuel exhaustion and improper oil temperatures or pressures.

Engine performance for any operating condition can be accurately simulated. This includes starting, ground operation, normal and emergency flight operation and use of the afterburner. Variations in throttle setting, altitude, air speed and temperature can be shown.

The trainer, operated on 110-volt 60-cycle alternating current, consists of three units connected by cable:

- **The operator's console** is a mockup of the throttle and engine controls in a jet cockpit.
- **The instructor's console** is a bank of switches and dials for setting up flight and emergency conditions.
- **The demonstration panel,** major unit of the simulator, is an illuminated cross-



INSTRUCTOR'S CONSOLE (l.) alters simulator's operating conditions. Operator's console (r.) includes throttle, engine controls.

section of the engine. It depicts in color the illusion of air, fuel and exhaust gases going through the engine. The intensity of the lighting varies with engine temperature, and the rate of flow of the lighting varies with the velocity of the gases.

Cockpit Instruments

On the demonstration panel are all instruments found in the aircraft cockpit. These include the altimeter, air speed indicator, free air temperature gage, fuel pressure gage, fuel flowmeter, tailpipe temperature gage, exhaust gas pressure gage, tachometer, oil temperature and pressure gages.

Also, warning lights to show anti-ice on, ignition, fuel pump failure, emergency fuel on, engine oil overheated and fire. There are instruments to show the simulated temperatures and pressures throughout the engine, afterburner fuel flow, air flow and thrust.

Animations on the engine cross section show operation of the starter air valve, fuel drain valve, inter-compressor bleed valves and exhaust nozzle.

The entire engine panel is mounted on a sliding track in the main cabinet. This permits it to be retracted into the cabinet for shipping or storage. The panel also can be partially retracted during operation so that the student can see only the cockpit instruments.

The cabinet holding the demonstration panel also houses the entire computing mechanism and sound simulator. In addition, there is room to store the consoles used by the student and instructor as well as the cables. Overall size of the cabinet is three-by-four-by-eight feet.

Control of Sound

The realistic sound simulator operates through a loudspeaker. It can reproduce normal noises of starting, acceleration, use of the afterburner and shutdown, as well as abnormal sounds that come from a bearing failure or seizure. These can be introduced by switches on the instructor's panel.

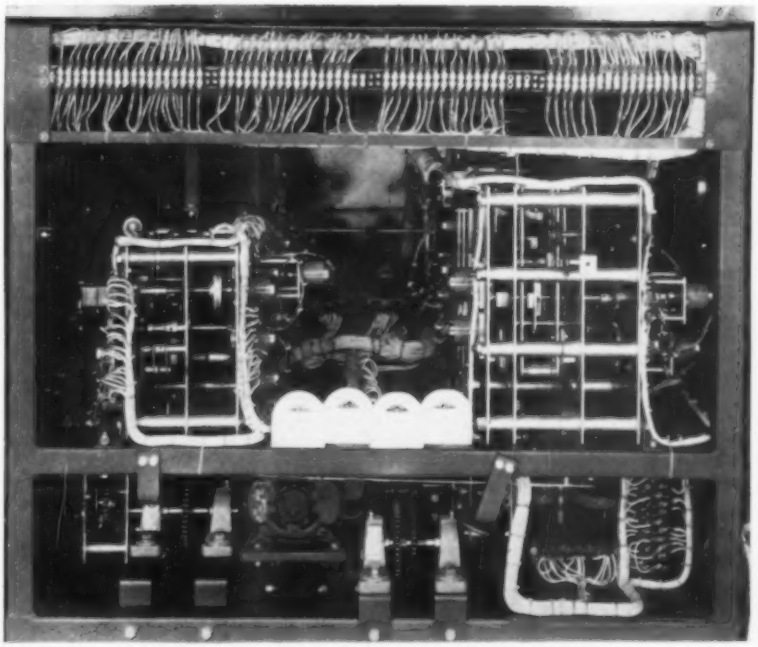
All noise levels can be adjusted according to the size of the classroom or shut off entirely.

The engine computer in the Burton-Rodgers design is mechanical, not electronic. The calculations are made by links and cams to simplify maintenance.

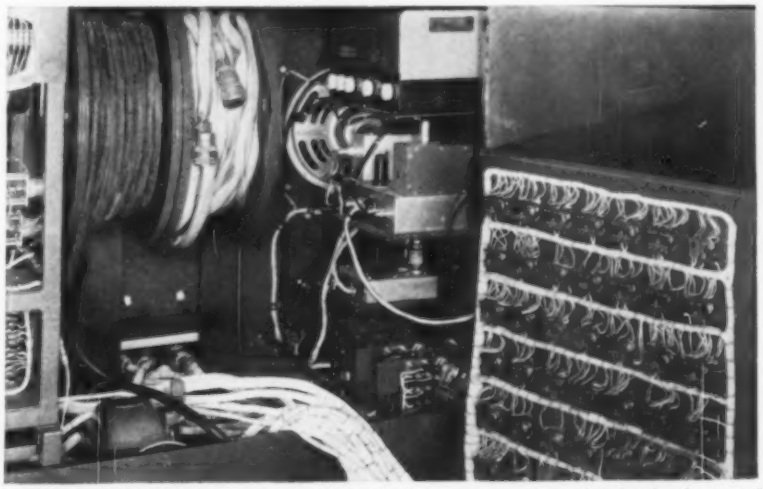
Operating procedures are the same as those for a real engine except that the time required to come to a stop has been shortened. Realism is added by the fact that errors made by the student are reflected in the same kind of failures he would meet in actual operation.

When he makes the mistake, the trainer will simulate a hot start, failure to start, flameout, leanout, engine surge or excess temperature.

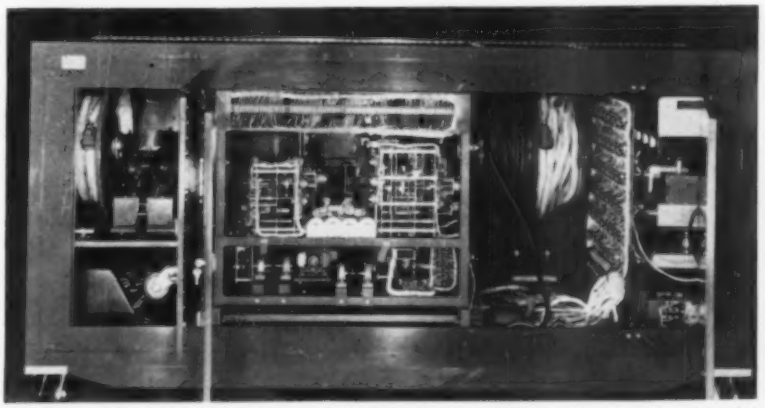
Advantages of the simulator over an



CLOSEUP shows detail of simulator's mechanical computing mechanism.



SOUND REPRODUCTION mechanism and loud speaker are housed behind relay panel.



CABINET ready for shipment or storage. Student, instructor consoles are stored at left.

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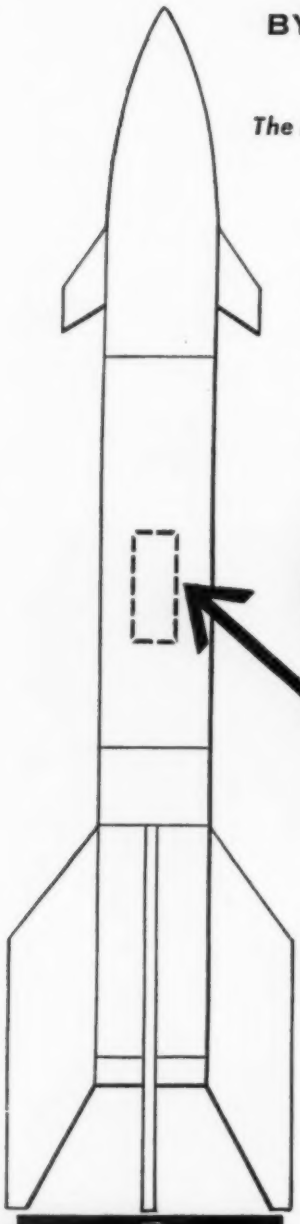

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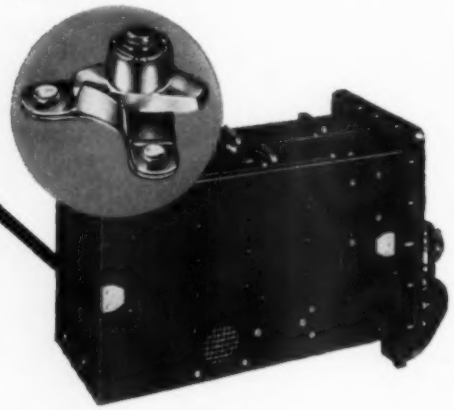
- Tests show no sheet separation—fastener locks with the effect of a nut and bolt assembly.
- Vibration tests also had no effect on the Rotary Latch.



F. P. Bassett, Project Engineer:

- Rotary Latch selected for use on cowl access doors on Bell's latest vertical-rising (VTOL) aircraft.
- The new PANELOC Rotary Latch is excellent for hinged doors and applications where maximum access and opening are important design considerations.
- Its simplicity, vibration resistance, ease of installation and cost are other factors that resulted in Bell's adoption of this new fastener.
- Now in use on fixed-wing aircraft, helicopters, missiles, electronic components.

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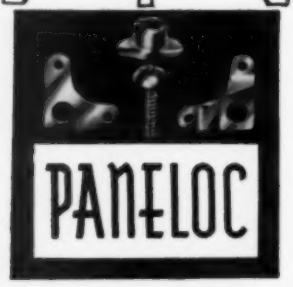

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actual engine mounted in a test cell are:

- Lower operating costs.
- Release of expensive equipment for actual operation.
- Lower noise level, permitting instruction while the engine is operating.
- Ability to demonstrate, on the ground, all variations in altitude, air speed and air temperature.
- Ability to demonstrate malfunctions without abusing an engine.
- Visual display of the conditions inside the engine.
- Ability to demonstrate to larger classes than would be possible in a test cell.

The Burton-Rodgers prototype, built on specifications provided by the Wright Air Development Center for a requirement originating with the Air Training Command, is at Chanute Field, for evaluation.

Engine manufacturers, including General Electric and Pratt & Whitney, are studying the project and there is a strong possibility that it will be adopted for other jets, eliminating the use of whole engines and cutaways for training purposes.

New Formula Predicts Nosewheel Shimmy

A formula which accurately predicts nosewheel shimmy characteristics has been evolved by William J. Moreland, chief of the Mechanics Research Branch of the Aeronautical Research Laboratory at the Wright Air Development Center.

The problem of nosewheel shimmy has been studied for 30 years without any important steps towards solution. In recent years, high landing speeds have forced an intensification of interest in the problem because they cause shimmy to build up to a damaging level too rapidly for the pilot to take corrective action.

Moreland rejected the traditional theory that shimmy vibrations are caused by the flexibility of pneumatic nosewheel tires which must dissipate much of the energy of the airplane's forward motion. The inconclusive results of past studies indicated to him that the cause was being sought in too narrow a field. The equation used for nosewheel stability by the proponents of the tire theory included only three parameters in which critical factors might be found; the lateral sturdiness of the tire, its yaw sturdiness and the length of the arm from the pivot to the wheel. Moreland developed an equation involving 15 parameters including damping and structural variations. It indicated that the supporting structure was a more likely source of shimmy than the wheel itself and that the pneumatic tire is

MODEL for nose-wheel shimmy tests.

actually a stabilizing influence.

To test the theory, WADC built a test model of a nosewheel with an accurately adjustable silicon fluid damper designed by Moreland. With this device it was possible to get quantitative measurements of the degree of stability obtained and the frequencies of oscillations encountered.

Tests made with the model showed that it was possible to get a shimmy with a rigid wheel and no tire. They also proved that Moreland's equation predicted the influence of parameter changes not considered by earlier analyses. The fundamental cause of the more violent forms of instability was found to be located in the supporting structure rather than in the nosegear proper.

Because of the favorable results of the model tests, WADC carried out a field test program using full-scale aircraft. A C-119 cargo plane with its regular landing gear began to shimmy at a taxi speed of 60 knots and the gear eventually buckled. After modifying the structure to meet the requirements of the new formula, the same airplane was taxied over an obstacle at speeds up to 120 knots without shimmying.

Westinghouse to Build F4D Fire-Control Units

Westinghouse Electric's Air Arm Division has received a $22.7 million Navy contract for its new Aero 13 interceptor fire control system for installation in the Douglas F4D. The new system employs a novel cylindrical modular packaging which enables it to fit into the nose of the F4D, yet permits rapid replacement of individual components. Production deliveries are scheduled to begin this spring and continue into 1957

NEW - Air-transportable Shelter

TAC Flight test at Langley AFB of ***Helicop-Hut*** *with complete radio relay installation.*

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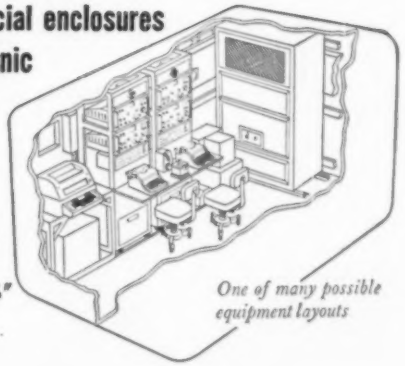

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- Inside dimensions – 76" x 76" x 96"

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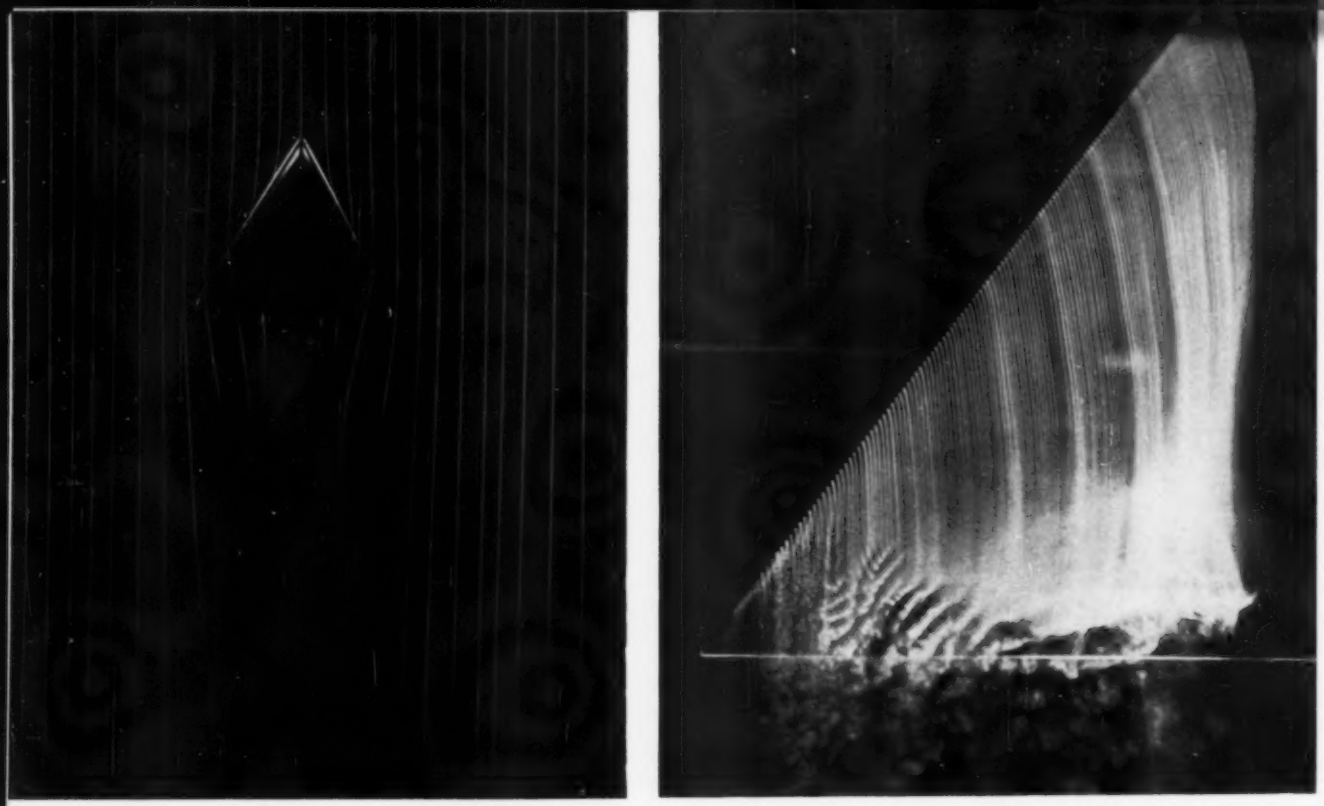


TIP VORTICES and flow separation on a delta wing are clearly defined by smoke streams (l.) and smoke introduced at leading edge (r.).

Smoke Traces Aerodynamic Patterns

"Aerodynamics would be a cinch if we could only see the air!"

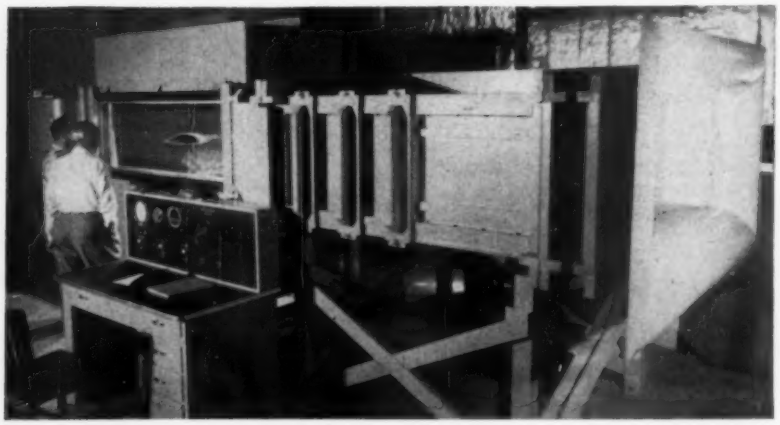
Every student and instructor in aeronautical engineering has said that at one time or another.

The recorded history of aerodynamic successes shows the ability of some students of air flow to "see" the streamlines and vortices as if they were opaque.

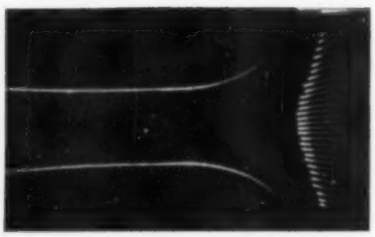
One of the basic tools for flow visualization is the smoke tunnel, a low-turbulence, slow-speed tunnel in which streamlines of a heavy smoke trace out the flow patterns over airfoils and bodies.

Among the finest examples of smoke-flow studies are these, made in the Collins two-dimensional and three-dimensional smoke tunnels of the Collins Aeronautical Research Laboratory, Cedar Rapids, Iowa, under the direction of Dr. Alexander M. Lippisch.

Collins Aeronautical

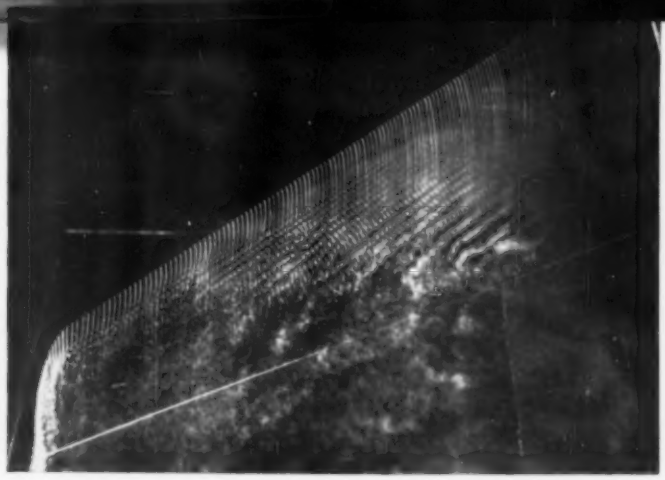


TWO-DIMENSIONAL smoke tunnel will be available for sale to high schools and colleges.



VENTURI flow pattern in sequence:

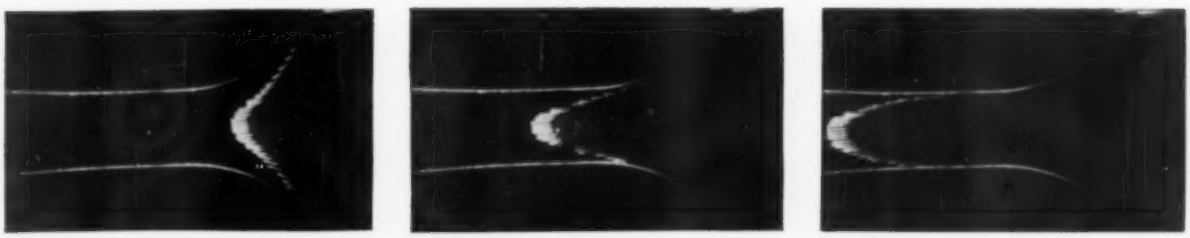
ACCELERATED flow over airfoil:



LATERAL FLOW of boundary flow can be seen in 3-D tunnel.

THREE-DIMENSIONAL Collins smoke tunnel (left); swept wing in two-dimensional smoke flow field shows vortex formation.

researchers study flow patterns with three-dimensional tunnel



SMOKE PULSES show the speeding up of streamlines in the center of the venturi, and plot a velocity distribution.

PULSE TECHNIQUE demonstrates vividly the acceleration of air over the upper curve of an airfoil, reducing pressure to produce lift.

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MALLORY Ti SHARON

New Engineer Talent Goal of R.P.I. Plan

Liberal Arts graduates are now entering the engineering ranks through a new educational venture undertaken by Rensselaer Polytechnic Institute in cooperation with the United Aircraft Corp.

The venture is another industry-education attempt to find ways of overcoming the national shortage of scientific and engineering talent.

It is in addition to (and completely separate from) the graduate studies program for applied scientists and engineers established by Rensselaer last fall in South Windsor, Conn., for the southern New England region, following a grant of $600,000 by United (AW Oct. 24, p. 25).

Thirty-nine Pratt & Whitney students and 12 employes of Hamilton Standard, both divisions of United Aircraft, have enrolled in the study program consisting of a 30-week course to be followed by additional evening school studies.

These students, almost without exception, are new employes of the United divisions.

All the students are college graduates with either a liberal arts or science degree in a field other than engineering. Upon completion of the 30-week course, they will be qualified for engineering work and assigned to jobs at Pratt & Whitney Aircraft or Hamilton Standard.

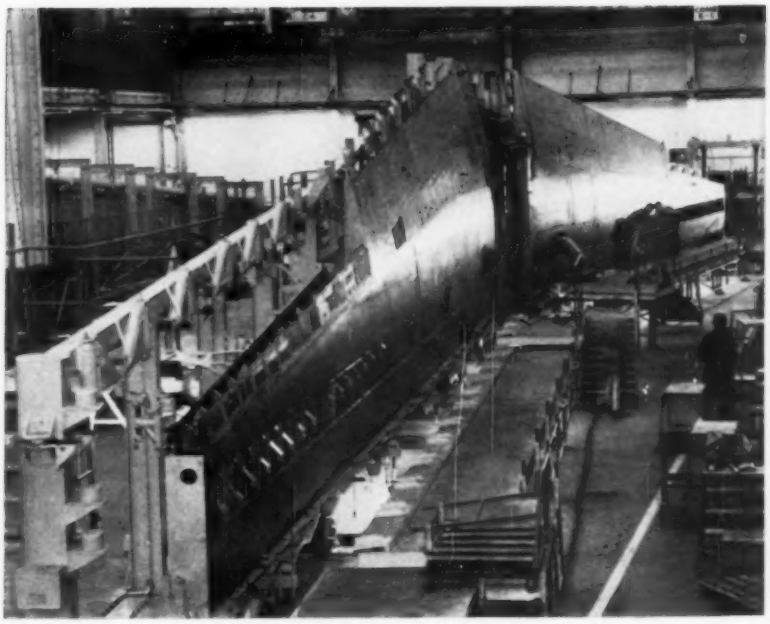
The evening classes offered by Rensselaer will bring successful candidates a certificate entitling them to eligibility for admission to Rensselaer's Graduate Division at the R.P.I. Hartford Graduate Center. If admitted to the school, they can take studies leading to a master's degree in several engineering or science fields.

Students entering the program must show academic ability and aptitude for graduate study of the highest quality and indicate a desire for careers in engineering and science.

Thus, this course has the potential of providing another source of supply for technology from a highly qualified group with a general rather than a specialized college education.

All the students will study full-time until they complete the first 30-weeks of the program, at the same time drawing regular salaries from the UAC division to which they are assigned. The full cost of tuition, faculty salaries and such equipment as books and drawing boards will be assumed by the UAC divisions.

Another group of about 60 students is expected to start studying under this plan in July.



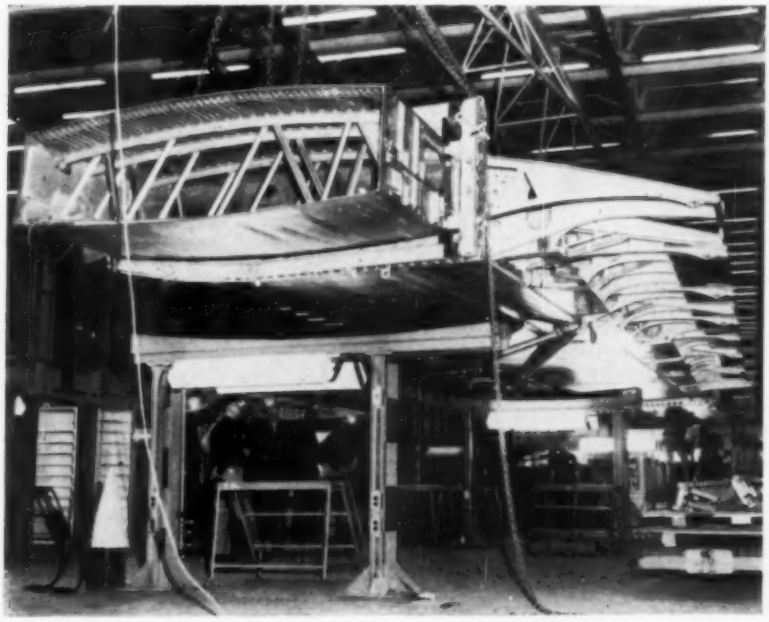
Final Form for 1649A Wing

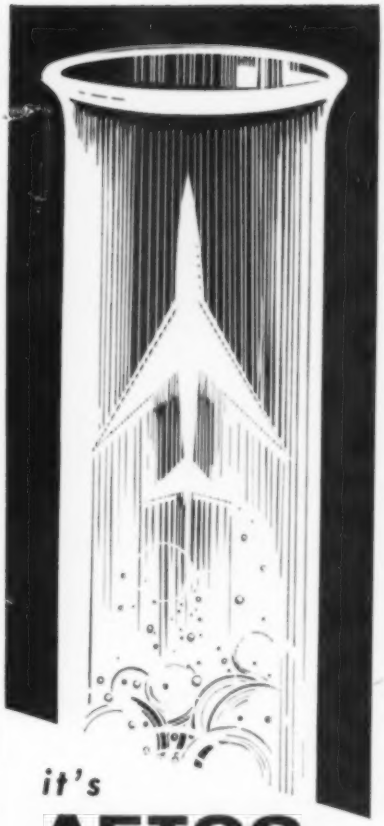
Burbank—First of the huge wing structures for the 36 Lockheed 1649A transports on order is nearing completion. Rollout of the aircraft is now scheduled for August; the first flight for October.

The integrally-stiffened wing (AW Oct. 10, p. 35) spans 150 ft. and is being assembled as a single unit in a vertical mating jig to conserve floor space.

In the above picture, the wing has been unspliced at the center for removal from the mating jig. Subsequently, each wing half is carried by crane to an installation area where hydraulic lines and other components are fitted prior to wing-tank seal and joining to the fuselage.

For further installation work (below) the wing panels are tilted to a horizontal attitude and lowered onto wing bucks for easier accessibility.





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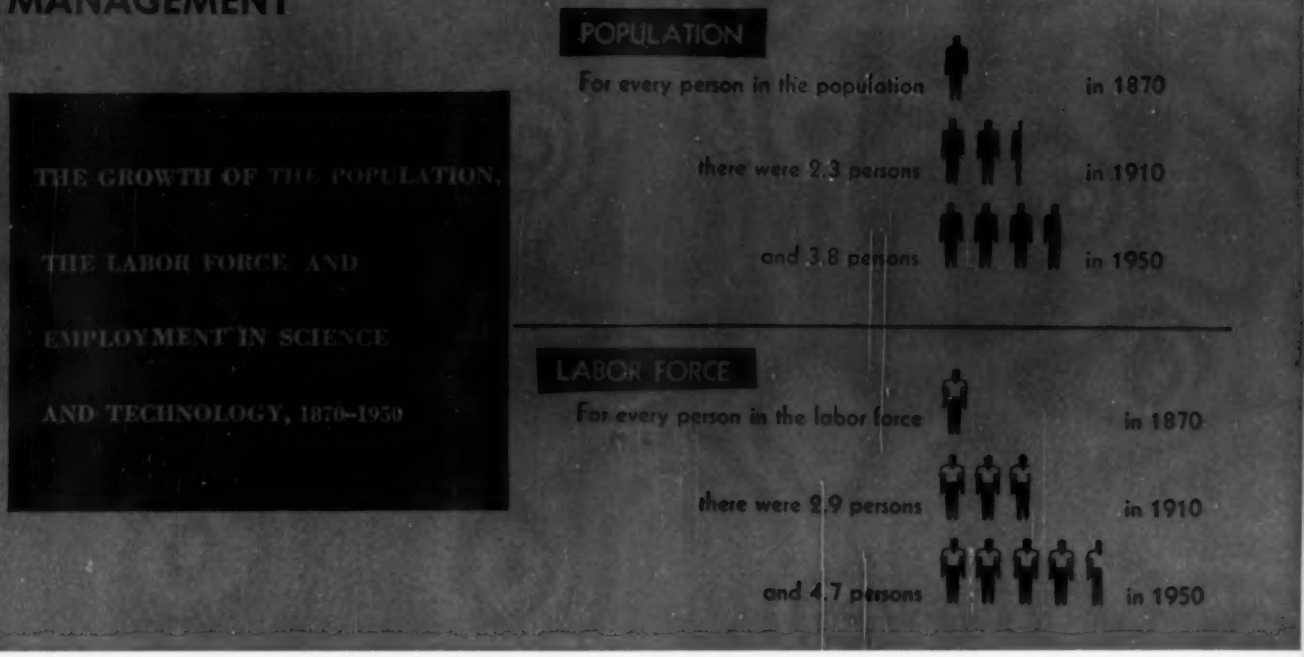


Attack on Engineering Shortage Gains

By Henry Lefer

Everybody has been talking about the engineering manpower shortage, and now finally somebody is starting to do something about it.

The "somebody" is a composite of educators, industry, government, public-spirited citizens and engineering professional societies who are coming up with a number of promising approaches involving better utilization of our engineering manpower and ways of increasing the supply of new talent.

Regardless of their steps, however, the situation not only will remain serious but is likely to get worse. It can be likened to a man trying to fit a 32-in. belt around a 46-in waist: no matter how he turns he can't stretch it enough to go around.

The many columns of "help wanted" advertisements illustrate this point. A recent Sunday edition of the New York Times carried more than 115 columns (14 pages) of ads offering jobs to engineers. A typical recent issue of AVIATION WEEK contained 35 pages of such ads.

When the American Institute of Physics opened a job placement bureau at the Hotel New Yorker during its annual meeting in New York in January, the bureau was swamped both by industry "talent scouts" and by scientists interested in seeing what was being offered.

Industry recruiting teams are swarming all over the nation's campuses, elbowing each other to be first in line to offer the year's crop of graduating engineers $400 a month starting pay. One company is reported to be offering universities $3,000 for each student that accepts its employment offer.

An eastern airframe manufacturer estimated a cost last year of about $1,500 for each of the 600 engineers the company hired, including an advertising outlay of $350,000.

No Easy Answer

As in other shortage situations, the tight supply has set off a scramble which aggravates an already serious situation.

In the midst of the scramble, charges are made—and denied—of hoarding, inefficient utilization of the present supply and exaggeration of the need. These charges can be made to stick; but they tell only part of the story. The American system of enterprise and the mobility of our labor force contribute built-in factors preventing most efficient use of manpower. And we cannot force a man who has studied engineering to take a job in engineering.

The basic long-term answer is a greater supply of engineers, and the place to attack this phase of the problem is in the high schools.

In the meantime, various short-range plans are being implemented aiming at immediate improvement of our utilization of the present supply.

Many of the cures will create uncomfortable side reactions. For example, the key to greater interest in technology by students is the creation of a larger, more effective force of science and mathematics teachers; but these teachers will come from the same top intelligence bracket of our population that supplies our engineers and scientists.

We can relieve our engineers of part of their burden by giving them more help in the form of technicians and engineering aids; but this may divert many promising young people from four-year engineering courses to two-year technical courses.

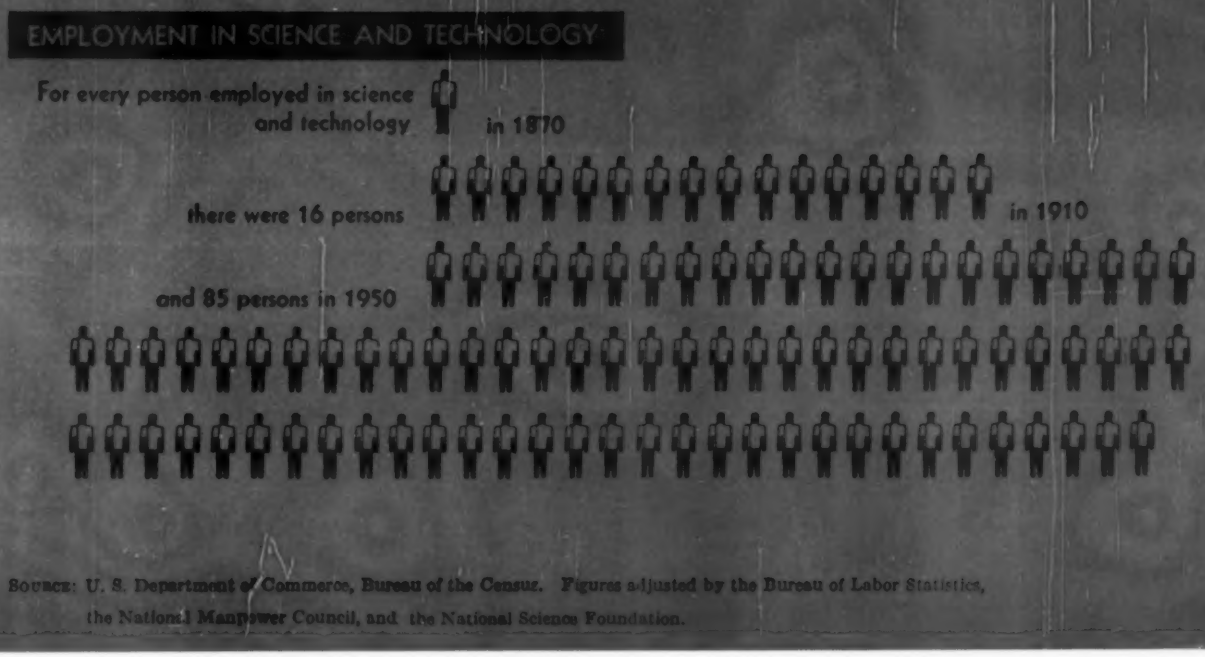
Raising industry salaries will put the schools and government at a disadvantage. If the schools or government raise their salaries, then industry will have more trouble filling its needs.

The United States produced about

Manpower Squeeze

One of the most urgent problems facing the aviation industry today is the continuing shortage of trained technical manpower.

In a two-part series, of which this article is the first, Aviation Week re-examines the situation and offers some suggested cures.


EMPLOYMENT IN SCIENCE AND TECHNOLOGY
For every person employed in science and technology
in 1870
there were 16 persons
in 1910
and 85 persons in 1950
Source: U. S. Department of Commerce, Bureau of the Census. Figures adjusted by the Bureau of Labor Statistics, the National Manpower Council, and the National Science Foundation.

Momentum

23,000 new engineers last year, an increase from the 20,000 graduates in 1954, but hardly enough to match the technological growth which requires an ever increasing proportion of engineers and scientists in our work force.

Technology's Growth

Here is an indication of how technology has grown in this country:

• **Population**—For every person in the population in 1910, there was 1.64 in 1950.

• **Labor**—For every person in the labor force in 1910, there was 1.62 in 1950.

• **Science and technology**—For every person employed in science and technology in 1910, there were 5.3 in 1950.

The number of technical people grew at a rate more than three times as great as the general population or labor force from 1910 to 1950.

More recent figures for the period 1930-1954, show that the population rose by 32%, the number of engineers by 202% and the number of scientists by 335%. The trend to technology is accelerating.

Prof. J. D. Ryder, dean of engineering at Michigan State University, pinpoints the problem: "Much more engineering goes into a turbine than went into a Corliss engine; there is more engineering in a TV set than in a crystal radio set. So we can hardly expect other than an engineering scarcity for a good many years to come."

Dr. Cledo Brunetti, director of engineering research and development at

Manpower Utilization Program

From interviews with top aviation industry engineering executives, government officials, educators and engineering union representatives, Aviation Week has constructed a 26-point program, outlining the most effective things that are being done and can be done to alleviate the nation's technical manpower shortage. The points, with some overlapping, are:

- Increase use of technicians and engineering assistants.
- Provide tools such as electronic computers, wind tunnels, model shops, laboratories, etc.
- Standardize techniques, making it possible for sub-professionals to take over some of the engineer's work.
- End hoarding and over-hiring of engineers.
- Reduce duplication of engineering effort within and between organizations.
- Investigate organization of engineering, comparing advantages of project and systems engineering approaches.
- Investigate the hiring of alien engineers.
- Find where subcontracting can lighten the engineering load.
- Employ university and high school teachers on a part-time basis.
- Take legal advantage of Selective Service regulations.
- Recognize the human needs that bear upon engineers' morale.
- Raise the engineering salary structure.
- Provide the opportunity for advanced study and professional development.
- Provide parallel paths of development, so the engineer need not become a manager or supervisor to get ahead.
- Institute company programs for training technicians.
- Set up cooperative educational programs with the schools.
- Lend industry engineers to the schools on a part-time basis.
- Set up institutes and fellowships for teachers, to give them greater awareness of industry's needs and problems.
- Provide higher salaries for beginning instructors.
- Improve utilization of mathematics and science teachers.
- Permit instructors to teach extra hours for extra pay.
- Improve teaching procedures.
- Set up system of awards and honors for students and teachers to encourage and reward the study of science.
- Employ retired engineers as teachers or industry consultants.
- Increase promotional activities to interest young people in engineering.
- Expand scholarship programs to help gifted students finance their engineering education.

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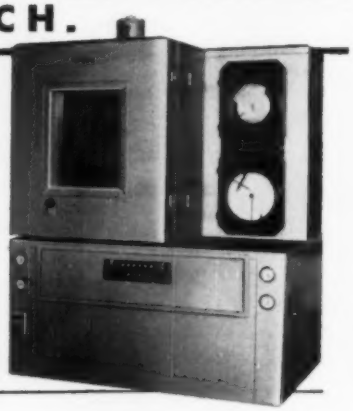

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P-9514, Aviation Week
1125 West 6th Street, Los Angeles 17, Calif.

General Mills, had this to say before a congressional committee studying the impact of automation: If we had to turn out the nation's 1955 workload with 1940 tools, we would need a labor force of 195 million instead of today's approximately 65 million. Technology, reflected in mechanization-automation, has enabled the U.S. to constantly increase its Gross National Product without fantastic increases in our working force or lengthening of the work week. The role of technology will increase in the future, increasing the demand for engineers and scientists.

Technicians and Aids

A standard gripe of aviation engineers is that they have to spend too much time on the board or in working out long, involved computations that properly trained sub-professional aids or technicians could handle. Management generally recognizes that it is uneconomic to saddle high-salaried engineers and scientists with work that is within the capabilities of lower-paid employes, and usually has definite policies with regard to giving the engineer such assistance.

When it comes to implementing these policies, however, that ugly word "shortage" crops up again. Ratios of between three and five technicians to every two engineers are considered ideal. The trouble is that this country is graduating fewer technicians than engineers.

Compared with the upcoming crop of 23,000 engineers, the nation's technical schools will produce about 14,000 technicians, the reverse ratio of what is desirable. The National Council of Technical Schools estimates that U.S. industry can easily absorb five times as many engineering technicians as are now being trained in technical (two-year) institutes.

Russia's 1,500 technicums (technical institutes) are expected to graduate 60,000 engineering technicians this year, just about enough to meet U.S. requirements. According to the study, "Soviet Professional Manpower," by Nicholas De Witt of Harvard's Russian Research Center, the proportion of technicians to engineers in the Soviet Union was about 17 to 10 in 1950, the last year for which there are reliable statistics. There have been from three to five applicants for every opening in Russia's technicums. So the schools have become increasingly selective and, it is thought, may soon restrict applicants to those who have completed their secondary education.

Many U.S. companies have set up their own programs to deal with the technician problem. Boeing Airplane Co. runs its own training program for draftsmen and believes that filling its technician ranks will be no problem in the foreseeable future. General Mills

cooperates with local schools in Minneapolis in technician training programs. Bell Aircraft Corp.'s Niagara Frontier Division employes are offered after-work classes in blueprint reading, pattern layout, template interpretation and electronics. The teachers are company employes who have been certified as instructors by the Adult Education Dept. of the New York State Board of Education. These examples are typical.

Wider use could be made of the available technicians if industry practiced greater standardization, many observers believe. The resulting simplification would make it possible for a professional engineer to turn over many problems to his engineering assistants.

Computers Can Help

A well-equipped and well-staffed computer section can ease the engineer's load, solving problems for him quickly and freeing him to do more constructive thinking. Many companies, such as Sperry Gyroscope Co., provide computer support for each major engineering group. As engineers and designers become familiar with computer capabilities, they find more applications for them. Many companies report they have a sizeable quantity of additional computers on order to help deal with the snow-balling backlog of computer-type problems.

This has led to a warning against "computeritis"—"maybe we're trying to solve too many problems," according to Frank Fink, vice president and chief engineer, Ryan Aeronautical Co. This view is also suggested by Robert L. Bortner, assistant chief engineer, administration, Republic Aircraft Corp. The company has a sizeable complement of computing machines, with more on order. This does not necessarily result in a manpower saving, Bortner says, because "instead of doing 15 studies on a project, our engineers may now want perhaps 40." However, the greater number of studies probably will mean a better end product.

Other tools for the engineer, such as wind tunnels, laboratories and model shops, permit the engineer and designer to test his ideas more quickly and thus speed the development cycle.

Ryan saves a great deal of drafting time by a simple photographic technique. Pictures are made of wire and tubing mockups, and these then serve as engineering drawings, eliminating a good deal of drudgery on the drawing board.

One Republic timesaver which has paid off handsomely is the Engineering Correspondence and Specification Section, a pool to take over the engineer's letter-writing and composition chores. Incoming inquiries are funneled through this centralized group and a specialist assigned to answer each one. He contacts the indicated engineer in person or over the phone for necessary information and then answers the letter. Some men are disappointed at losing their private stenographer, but Republic says most of its engineers have welcomed the plan.

A good example of what can be done about improving utilization of engineers is this set of figures from Boeing Airplane Co.: In the period from 1951 to 1955, the company was able to reduce the proportion of engineers required in preliminary design from 90% to 65% of those employed in this phase of operations; the engineers required in production engineering droped from 55% to 40% during this period. In the sustaining phase, the percentage of semi-skilled went from 11% to 33%.

(Next week's article analyzes engineers' gripes about management and examines industry's efforts to remove the seeds of dissatisfaction and improve utilization of trained manpower. It also discusses what can be done to increase tomorrow's supply of engineers and scientists.)

More Technical Talent From New York

One response to the aviation industry's plea for more trained technicians has come from New York City where construction has begun on a $8.6 million Aviation Trades High School. The school, which will house 37 shops and a 15,000-sq.-ft. hangar, will be capable of handling 2,500 regular students and from 4,000 to 5,000 night-time enrollees.

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ACTUAL SIZE

Photograph of the new General Electric 20 KVA hydraulic constant speed drive illustrates the small size of the 35-pound unit.

GENERAL ELECTRIC ANNOUNCES

New 20 KVA hydraulic constant speed drive ...weighs only 35 lbs

More and more, equipment on today's aircraft requires constant frequency electric power for optimum performance. To provide more reliable a-c power, General Electric has developed a new 20 KVA hydraulic constant speed drive with a weight of only 35 pounds. This 8000-rpm drive delivers a full 32 hp over an input speed range of 3900 to 7500 rpm. Steady state speed control of $\pm 1\%$ is provided by a built-in mechanical governor and speed control to $\pm 1/10\%$ can be obtained with an additional trimming device. Automatic paralleling can also be provided for two or more drives.

The compact, lightweight design of this 20 KVA drive permits pad mounting (with generator attached) on modern jet engines in most airframe applications.

This new 20 KVA drive has the same service-proven ball piston design as the General Electric 9 KVA drive now operating successfully on the Douglas A4D Skyhawk, currently in production for the U.S. Navy.

FOR FURTHER INFORMATION on how a G-E hydraulic constant speed drive can fit the electric requirements of your aircraft, contact your General Electric Aviation and Defense Industries Sales Office. Send coupon below for bulletins on G-E constant speed drives.

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GET-2480 Theory of Operation
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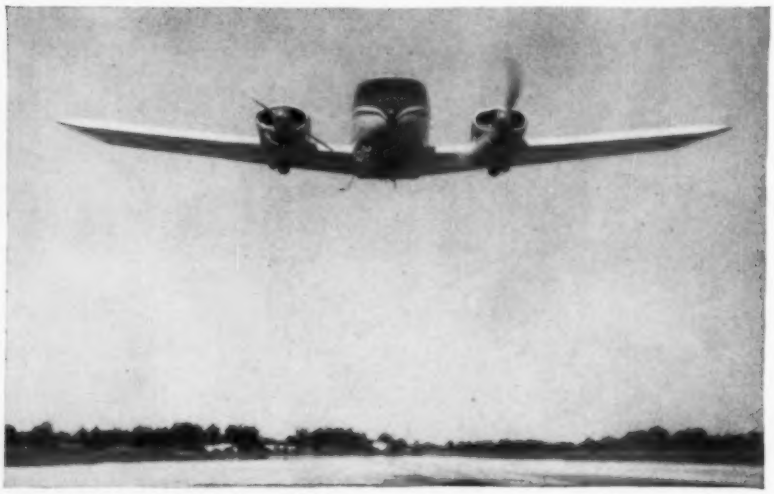

ENGINE-OUT PROCEDURES on light twins vary from type to type. CAA cautions pilots to learn specific methods for emergencies outlined in manuals supplied by each maker.

CAA Warns Light-Twin Pilots Of Need for Engine-Out Training

By Erwin J. Bulban

The need for a practical knowledge of emergency procedures after an engine failure has assumed new importance with the increasing numbers of light twins now joining the business aircraft fleet and flown by pilots who, in many instances, have made the transition to multiple-engine from single-engine aircraft.

Civil Aeronautics Administration spokesmen emphasize that the new light twins are excellent and safe aircraft. They are concerned, however, over a number of accidents that have involved experienced pilots who apparently ran into trouble while demonstrating the engine-out performance of their new planes.

Approximately 11 light-twin accidents have been recorded in the last two years—a high percentage of them attributed to incorrect procedures followed after the loss (deliberate or otherwise) of an engine.

Indoctrination Need

Manufacturers have been aware of the need for indoctrinating their new customers prior to handing over the airplane and have adopted procedures to check them out either by their distributors or at the plant.

One prominent manufacturer of light twins said recently: "We raise hell with a distributor if he sends a customer on to us to pick up an airplane who shows unfamiliarity with the ship."

Although it's difficult to lay down hard and fast rules when dealing with a customer, the manufacturer said, the factory will insist that its own company personnel have a minimum of 10 hours multi-engine flight time before they are qualified to fly such types.

This includes engine-out on takeoff several single-engine landings, cutting off the fuel on one engine unexpectedly while in flight and bringing one engine down to zero thrust and allowing the propeller to windmill.

The Civil Aeronautics Administration recently issued a safety release recommending procedures to be followed in such emergencies.

The agency emphasizes that multi-engine pilots must have familiarity with these two vital aircraft speeds:

- **Engine-out minimum control speed:** the airspeed below which the aircraft cannot be controlled in flight with one engine operating at full power.
- **Engine-out best climb speed:** The airspeed which provides the best rate of climb or slowest descent with one powerplant out. This may be very close to the engine-out minimum control speed.

Control Speed

Engine-out minimum control speed is given in the manufacturer's aircraft flight manual and can be confirmed by practice. The published speed has been established for the most critical condition—the airplane fully loaded and with full takeoff power on the operating engine. In view of the fact that engine power increases at lower altitudes, engine-out control loss is more critical on takeoff, particularly from airports at low elevations.

In case of an engine failure at an airspeed below the engine-out minimum control speed, the other powerplant must be throttled quickly to a point where flight control can be maintained. If this power fails to prevent loss of altitude, the airplane should be landed immediately.

If it must be turned back to the field, it should be banked no more than five degrees in the direction of the operating engine in order to maintain maximum lift

Climb Speed

The best engine-out climb speed also is carried in the aircraft's flight manual. The airspeed giving the steepest angle of climb, for clearing obstacles, is usually lower and also is in the manual.

Pilots are warned to use extreme care in maintaining either of these speeds for these reasons:

- **They require prolonged flight** at speeds very close to the engine-out minimum control speed.
- **A deviation** of only a few miles-per-hour from prescribed speeds results in a significant decrease in climb performance. Loss of climb will result just as much from an too-high airspeed as too low, the CAA report warns.

The CAA will recommend in the future that its examiners not only be thoroughly familiar with these procedures but also that they make sure that the pilot is just as familiar with the particular model of airplane with which he is taking his test.

The latter is particularly important because the actual procedures involved in emergency vary considerably with each make of aircraft, and the pilot should not attempt to apply basic rules across-the-board for all aircraft. This procedure has been followed for many years by operators of large multi-engine aircraft, such as the airlines, who insist that a pilot be qualified for each particular model he flies.

The CAA therefore recommends that pilots learn from a qualified source, configurations of landing gear, flaps and propeller with which his airplane will maintain altitude with a full load and engine out. Tests should cover full gross weight, using the best rate of climb for at least five minutes, it is noted. Several fatal accidents have resulted from attempts to pull up for

a go-around with gear down when the airplane was incapable of climbing in this configuration.

Failure in Flight

To establish single-engine flight after an engine failure while cruising, it is recognized practice to apply METO power to the operating engine until level flight is clearly established. If the airplane is found capable of level flight or climb with the existing load, altitude and temperature, appropriate power reduction can be made. However, airspeed should not be permitted to fall below engine-out best climb speed, even though altitude is lost, since this speed should always provide the best chance of climb or the least altitude loss.

An ability to climb at about 50 fpm. in calm air is necessary to maintan level flight for lengthy periods in even moderate turbulence.

Czechs Swing Argentine Deal: Lightplanes for Wool and Wheat

Buenos Aires—Communist Czechoslovakia has penetrated the Latin American light aircraft market by means of a barter agreement with Argentina that provides for the exchange of some $500,000 in Argentine wool, hides and wheat for 18 airplanes and spare parts. An initial delivery of eight planes is scheduled to be made the latter part of this month.

The exchange gives tangible substance to President Eugenio Aramburu's recent statement that Argentina will continue to foster trade relations with the Soviet bloc.

A press official of the Argentine Ministry of Aeronautics told AVIATION WEEK's correspondent here that Russia also has submitted a proposal to his government to supply Argentina with MiG-15 fighters and bombers in an exchange similar to the Czech-Egyptian agreement (AW Feb. 13, p. 31).

The lightplanes initially were to be delivered to an Argentine import-export monopoly set up by former President Peron. This organization is now being dissolved, and its functions are being returned to private enterprise.

The aircraft now will be delivered to Skoda's Argentine representative, Dr. Mario Insua, for distribution.

Aero 45

Involved are the Skoda Super Aero 45 all-metal, four-place, twin-engine aircraft powered by 105-hp. Walter Minor 4-IIIs with feathering propellers. They

SUPER AERO 45s will arrive in Argentina this month, along with Czech service personnel.

LD-40 three-seater has unusual "reverse tricycle" landing gear with tailwheel under cabin.

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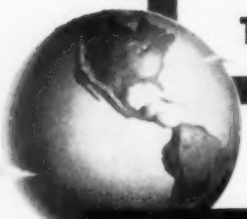

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are an improved version of the Aero 45 twin displayed at Canada's eighth International Trade Fair at Toronto last year. The new model has improved engine cooling for warm climates; the leading edge wing slats have been eliminated, and an improved propeller and instrument layout are provided.

The price has been set at $25,000 each, with sufficient spares for 2,000 flying hours. In addition, the contract provides that three Czech factory representatives will be sent to Argentina for a three-year period to help service the aircraft.

U. S. business-aircraft observers who saw the earlier version at Toronto last year said the aircraft fell far short in equipment and performance as compared with corresponding American airplanes. They were particularly dubious of the Aero 45's single-engine performance.

Nonetheless, it is reported that additional negotiations are under way whereby a total of 60 of the Czech twins would be sent to Argentina.

Additional negotiations are taking place on several other Czech aircraft:

• **Skoda L-60,** an agricultural spray/dust high-wing monoplane designed for short-field operation. Of all-metal construction, it is said to weigh 1,837 lb. empty and 3,014 lb. loaded. Price is $17,000. An order for eight L-60s is being discussed.

• **LD-40 three-place** low-wing all-metal monoplane powered by a 105-hp. Walter Minor 4-III. Cruise speed is about 114 knots. Unusual feature is placement of the tailwheel under the rear of the cockpit, providing in effect a tricycle landing gear in reverse. Price is given as $9,000.

• **Z-126 II is a two-place** low-wing monoplane powered by a 105-hp. Walter Minor and grossing about 1,100 lb. It sells for $10,000.

PRIVATE LINES

Learstar utilization: Burroughs Corp. made 240 flights in a six-months period averaging 1.5 hours each; Chance Vought, Inc.'s executive transport flew 560 hours in eight months with trip lengths averaging about four hours. Lear, Inc.'s Aircraft Engineering Service Division, Learstar builder, estimates that the planes will exceed 500,000 hours utilization collectively by the end of this year.

Among the propeller studies underway at McCauley Industrial Corp., Dayton, Ohio, is the use of magnesium and a new full-feathering prop for private planes. It is estimated that magnesium propellers would weigh about one-third less than contemporary all-

aluminum types. The firm has delivered over 3,000 of its constant-speed Met-L-Matic propellers and they are installed on about 70% of the Cessna 180s being delivered. Company says this prop has been running 1,500 hr. without any maintenance problems.

Instrument flight "shorthand" booklet, containing every known abbreviation and symbol used in IFR is being distributed gratis by Ross School of Aviation, Municipal Airport, Box 7071-N, Tulsa, Okla. Material was compiled by Civil Aeronautics Administration's Policies and Procedures Staff, Aviation Safety Standardization Division, Oklahoma City.

City of Winona (Minn.) is building a new shop area for Van's Air Service, Inc., large enough to accommodate two DC-3s. The business aircraft service operator plans to shift the major part of its facility from St. Cloud to the new base. Firm is a distributor for the Aero Commander and Lycoming and Continental engines.

Three prototypes of four-place executive airplane will be built by Bee Aviation Associates, San Diego, Calif. Powered by a 175-hp. Lycoming engine, design speed will be 160 mph., range will be about 700 mi. Price of production models is expected to be about $9,000.

The National Business Aircraft Assn. has worked out the final details of a new insurance plan for its pilot membership to provide compensation against possible loss of air transport ratings in the event of disability. The plan will provide payments to begin approximately 30 days after such contingency, supplying income while the pilot either regains his certificate or finds another position.

Beech aircraft inspection clinic, sponsored jointly by the manufacturer and its distributors, will be held from March 20th to mid-September. Factory teams will visit more than 30 locations throughout the U. S. to check more than 100 points on each airplane. Clinic will open to owners of all Beech models; up to last year it was devoted exclusively to the Bonanza. Since the clinic started in 1949, over 6,000 Beech planes have been inspected free of charge.

Three Piper Apaches have been delivered to the Canadian Department of Transport, adding to growing number of light twins now being used by government departments. Other Apache users include the Colombian Civil Aeronautics Administration, New Zealand

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Department of Transport Belgian Congo and Nigerian Government. One is also used by the Chief of the Cuban Air Force. . . . Florida Forest Service has received four 150-hp. Piper Super Cubs to be used in fire spotting and control and law enforcement.

All sales activities for Radio Corporation of America's line of commercial and private electronic equipment have been transferred to 11819 Olympic Blvd., Los Angeles, from Camden, N. J.

Trans-Pacific crossing was made by two Beech Super 18s from San Francisco to Tokyo with stops at Honolulu and Wake Island. Longest leg, 2,400 mi. from the mainland to Hawaii was flown in 12 hours, using extra tanks which increased fuel capacity from normal 282 gal. to 632. Planes were delivered to the Japanese Coast Guard.

Marsh Aviation Co., Phoenix, Ariz., which handled approximately $400,000 in aerial application business last year, has been sold to Arizona Bancorporation, a holding company. Leslie A. Wood, vice president of Valley National Bank of Phoenix, is now president of the aviation firm, replacing William O. Marsh.

All-women's international air race, to be held May 13-23, will offer $2,000 in cash prizes for six first places, in addition to trophies, all to be donated by the Cuban government and native firms. National Aeronautic Assn.-sponsored event will originate in Hamilton, Ont. and terminate in Havana. Entries deadline is May 1. Write: Irma Price, Entry Chief, 242 S. W. 8th St., Miami, Fla.

First Fiberglas Taylorcraft for New Zealand has been completed. Firm reports that it has orders for 20 of these airplanes pending delivery of the first one.

Scintilla appointment: Pacific Airmotive Corp., Burbank, Calif., will handle sales and service for the Rocky Mountain area through its branch at Stapleton Airfield, Denver, Colo.

Two Sikorsky S-55 helicopters have been added to fleet of California Co., New Orleans, La., for use in offshore oil operations. They will be delivered in February and April. An S-55 was delivered early in February to Grumman Aircraft Engineering Corp., N. Y. It will be fitted with a new doughnut-type flotation gear on the aircraft's four wheels. Entire flotation system, including bags, structure lines and compressed air cylinder weighs 150 lb. The S-55 is for standby duty over water for air-

rescue emergencies when Grumman pilots are making test flights.

Private plane flights to Cuba from U. S. increased to 641 airplanes in 1955 compared with 403 the previous year. The airplanes last year carried 2,000 people to Cuba compared with 1,304 in 1954. Elimination of red tape, providing a simple general declaration form and use of a special flight notification plan, are credited with increase in personal plane traffic between the countries.

Taxi Air Group, Inc., plans to inaugurate one-hour flights between Detroit and Cleveland for businessmen this spring. Four flights daily will be made each way by a de Havilland-Canada Otter floatplane, saving at least two hours compared to surface transportation. One-way fare is expected to be $14 plus tax. Schedule will be maintained from mid-April through mid-November. TAG plans similar service to Toledo later if a demand develops.

New business pilots organization, Society of Industrial Pilots, Inc., has been formed in the New York area. President of the new group is W. D. (Jim) Guthrie, long-time president of Roosevelt Field, N. Y. In addition to fostering interchange of ideas among membership, the group offers a "loss of license" insurance plan. Temporary offices are at 222 Seventh St., Garden City, N. Y.

First six civil helicopters sold in 1956 by Bell Aircraft Corp.'s Texas Division, Ft. Worth, all went to different countries: a 47G-2 with night flying instruments, dual controls and radio to the Austrian Army for rescue; a 200-hp. 47G with spray/dust kits to Helicopter Services of Auckland, N. Z.; a 47G demonstrator to Bell's West German distributor Hubschrauber-Vertriebs, Dusseldorf; a three-place charter 47G with hydraulic boost controls to Pacific Western Airlines, Vancouver, B. C.; a general charter type to Heliven, C.A., Caracas, Venezuela and one to General Air Transport, New Orleans.

Tricycle landing gear kit for Cessna 180 has been made available by Met-Co-Aire, Fullerton, Calif., which earlier developed a similar installation for the Cessna 170. Installed price at local dealers for the 180 gear: $1,045; for the 170, $950. Gear weight for the former is 34 lb.; for the latter, 33 lb. Model 180 kit is installed by moving installed spring leaf strut back 30 in. and installing it in a new box section. Nosewheel carrying a 5.00 x 5 tire, mounts fore and aft at the junction with the firewall.

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Cessna Leads in Plane Shipments

Cessna Aircraft Co. took an early lead this year over all other U. S. business and utility airplane manufacturers, delivering 248 units in January with a total value of over $3.7 million. Piper Aircraft was second with 194 airplanes valued at $1,815,474; Beech was third, delivering a total of 51 aircraft worth $1,807,600.

Cessna's January 1956 shipments exactly doubled the company's shipments of 124 planes in January 1955; dollar volume however was well over double the $1,235,000 figure of the same period last year an AVIATION WEEK survey disclosed.

Particularly noticeable in January's shipments was the large number of Cessna 172s delivered. This tricycle version of the Model 170 exceeded deliveries of its nearest competitor, the Piper Tri-Pacer, for the second consecutive month. Model 172 shipments started last November when 76 airplanes were delivered; December deliveries totaled 97 and January's were 132.

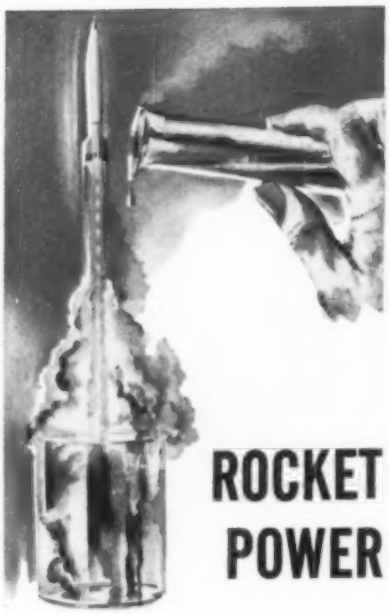
A further study of deliveries by the "Big Three," who together act as a bellweather for the industry, show that their combined deliveries in January also exceeded January 1955's in both number of units and dollar volume: 493 airplanes valued at $8,801,379 as against 322 valued at $4,173,000.

BUSINESS AND UTILITY PLANE SHIPMENTS

January 1956

	Complete Aircraft	Builder's Net Billing Price
Aero Design		
560A	9	$670,500
Beech		
Bonanza	37	
Super 18	6	
Twin Bonanza	8	1,807,600
Model 45 trainer	0	
Callair		
A5A	0	
A4	0	0
S1B1	0	
Camair		
480 Twin-Navion	4	166,000
Cessna		
170	20	
172	132	3,735,600
180	75	
310	21	
Champion		
Champion	12	59,500
Helio		
H-391B Courier	3	69,000
Lear		
Learstar Mk. 1	1	400,000
Mooney		
Model 20	5	50,137
Piper		
Super Cub	57	
Tri-Pacer	105	1,815,474
Apache	32	
Royal		
Royal Gull P136L1	2	149,000
Taylorcraft		
Tourist A15A	0	27,568
Model 20	3	
Totals	530	$8,801,379

Compiled by AVIATION WEEK from manufacturers' reports.



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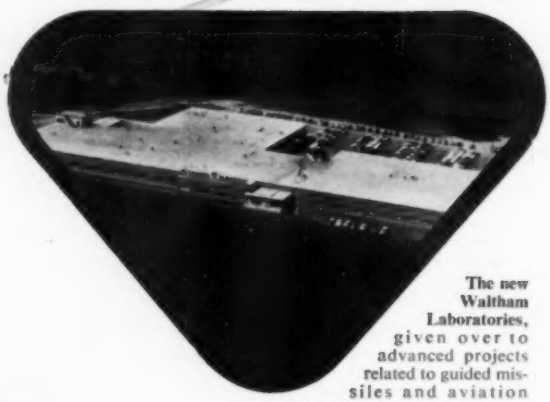
Dr. Edwin G. Schneider, Chief Engineer of the Electronic Systems Division, discussing wave-guide theory with top staff members of Waltham Laboratories. From left, *Paul B. Black*, Manager of Avionics Laboratory, *Dr. Sherrerd B. Welles*, Manager of Missile Systems Laboratory, *Dr. Leonard S. Sheingold*, Manager of Applied Research Dept., and (standing) *Dr. Oliver G. Haywood*, Manager of Waltham Laboratories.

Carl Cutler, electronics engineer, testing a traveling wave tube at the Waltham Laboratories.



The new Waltham Laboratories, given over to advanced projects related to guided missiles and aviation electronics. Completely air conditioned, the building contains 120,000 square feet of floor space.

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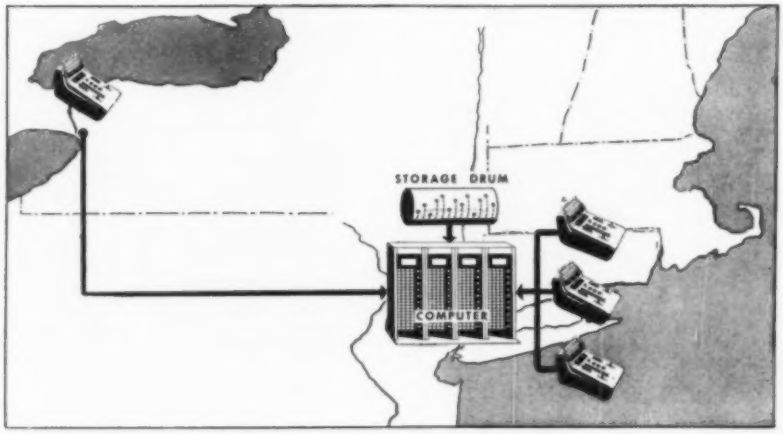

NEW AMERICAN AIRLINES plan will enable Buffalo (represented by computer at top left) to instantly interrogate New York reservations computer (below right) and to then sell space just as rapidly and efficiently as if it were another New York City ticket office.

New Airline 'Datamation' Theory To Undergo Evaluation at Buffalo

By Philip J. Klass

The forerunner of a nation-wide airline electronic data processing system designed to speed reservations handling and to practically eliminate the chance for human error will go into trial operation next month at the American Airlines reservations center in Buffalo.

Buffalo will be the proving ground for two new techniques, both of considerable interest to persons connected with airline reservations. They are:

• **Remote site operation** of a central reservations computer (Reservisor). The Buffalo center will be able to instantly interrogate American's central Reservisor in New York, 300 miles away, for space and sell such space just as if it were another New York City ticket office.

• **Use of punch cards** to record and process all reservation requests and associated information with the familiar advantages of using machines to sort, extract and collate data of financial and/or operational interest. Equally important, when the flight involves connections or stop-overs at way stations along the route, the punch cards will automatically transmit the request for space and all associated reservations data to each station involved. The information will be transmitted via American Airlines teletype circuits.

Gaining Momentum

Electronic techniques for mechanized handling of airline reservations inventory, pioneered by American and The Teleregister Corp., which built the original Reservisor for the airline, are gaining momentum in their acceptance by the transport industry. For instance:

• **American Airlines** will soon replace its original Reservisor with a new model that has roughly 12 times as much capacity. The new Reservisor will be able to handle 2,000 flight legs, compared to the present 1,000, for 31 days, versus 10 at present, with up to 255 seats per flight, compared to 127 seats per flight in the original version.

• **Braniff Airways** has ordered a Reservisor, for installation at Dallas, which can be interrogated by teletype machines or Agent Sets anywhere along its route.

• **American Airlines** is installing "Availability Panels" at its Chicago, Washington and Boston reservations centers. (For explanation of the difference between a Reservisor reservations computer, and an Availability Panel, see box below.)

• **United Air Lines** has installed Availability Panels at New York, Chicago, Los Angeles and San Francisco. This is the first step in what eventually will be a route-wide system with a central reservations computer to be installed at Denver.

• **Pan American Airways and National** Air Lines have ordered Availability Panels from Teleregister for installation at their New York City reservations centers.

• **Northwest Airlines** is considering the installation of a new system developed by Sperry-Rand Corp. This would not only provide a central reservations computer but also would keep a record of the number of space requests on wait list and the number of seats sold by each station.

Only The Beginning

Fast-growing airline acceptance of electronic inventory control is easy to understand. The airlines have only one commodity to sell—space—and it is one of the most perishable commodities in the world. The very speed at which airliners operate demands swift handling of reservations. If an airline oversells, it has serious customer relations problems. If it undersells, the lost revenue comes out of profits.

The next move will be to interconnect the reservations systems of several

Electronic Inventory Control Terminology

RESERVATIONS COMPUTER: A device with the capacity for storing large amounts of data which keeps a running, up-to-the-second inventory of space available on each of a number of future flights. The Teleregister Corporation's Reservisor, the only reservations computer now in use, can also be used to store up-to-the-minute information on flight arrival and departure times.

AGENT SET (HANDSET): A small device, resembling an adding machine, which enables a ticket agent or reservations center to instantly interrogate the reservations computer to determine if a given number of seats are available on a particular flight. If the seats are available, and are sold, the sale is automatically transmitted by the Agent Set to the computer which automatically adjusts its inventory figures accordingly. Cancelled space can be returned to the computer in similar fashion. The Agent Set can also be used to obtain information on flight arrivals and departures, set into the computer by the airline's flight operations department.

AVAILABILITY PANEL: A plug-board type device which can be interrogated for space availability by an Agent Set and which will automatically indicate on the Agent Set one of three possible conditions existing for a particular flight:

• Open for sale.

• Sold down to the "cushion." (This means that space cannot be sold without the agent contacting the controlling reservations center via teletype.)

• Sold out.

The Availability Panel is kept up-to-date by human operators, who in turn obtain their information by means of teletype to the reservations center, or an Agent Set connected to a remote reservations computer. The Availability Panel type system is somewhat less expensive than the Reservations Computer.

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AGENT SET can interrogate either Availability Panel or Reservisor computer.

airlines, enabling each to instantly interrogate the other's reservations computer or Availability Panel for connecting space.

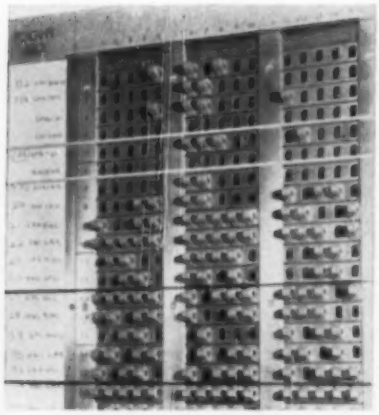
Although electronic inventory control systems will do much to speed reservations handling to enable the airlines to cope with anticipated traffic growth, there will still remain a large and costly area of manual operations. For example:

- **Name of each passenger,** his contact point, stop-over station and special instructions (such as "needs a wheel chair"), still must be recorded manually.
- **Multiple handling** of such data and transformation onto other records, is a slow, costly process and introduces the possibility of human error.
- **Obtaining necessary financial** and operational data from such manual records is a time-consuming and costly process.

However, electronic data processing equipment which will be available in the near future will perform many of these existing tasks automatically and will also provide services and information which is not now available to airline management and operations people, Charles G. Abbott told the Air Transport Association's Reservations Committee, during its recent meeting in New Orleans. Abbott is manager of Advanced Process Application for American Airlines.

In addition to the inherent advantage that "once information is correctly introduced into this system it cannot go wrong," Abbott said that electronic data processing could provide the airlines with the following:

- **All name, continuing space** and other identifying information would be stored automatically and be available to all users in a split second.
- **Alphabetic filing** of all passengers records, which has long been a dream of reservations people but impractical with present manual methods, will become a reality.
- **Messages to outlying stations** will be



AVAILABILITY PANEL (with operator, l., and closeup, r.) uses manually inserted plug-jacks to indicate on Agent Set whether space is available, down to "cushion" or sold out.

created automatically from the original customer record, in a form useable by the receiving station, and transmitted to it automatically without human intervention.

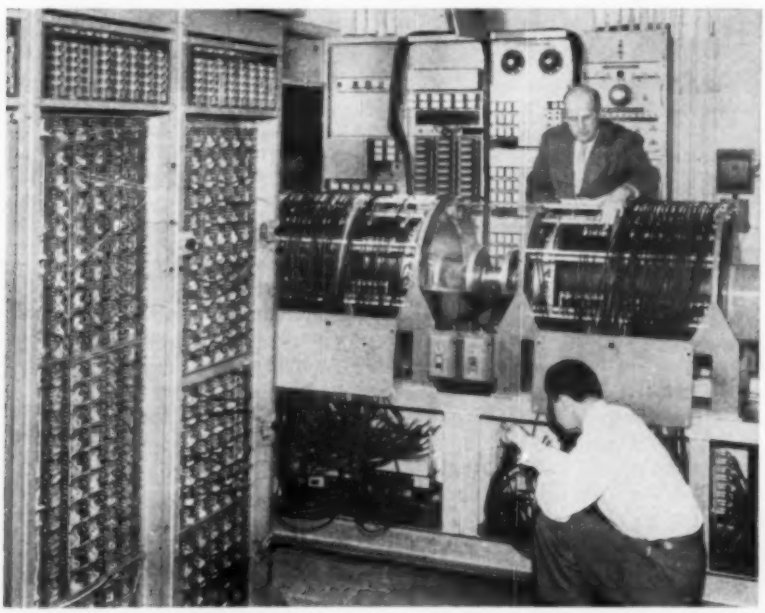
- **Passenger fare** will be computed automatically and filed with the record.
- **Automatic manifest preparation** for departing flight, including load computations.
- **Automatic ticket preparation** by electronic data processing machines.

In the field of revenue accounting, and possibly in flight scheduling, electronic data processing machines also offer a big payoff, Abbott believes. Unlimited reports, records, statistics and financial documents can be prepared with great speed.

"The time is at hand to start reassuring people that no one will be arbitrarily affected as a result of introducing (these) new and improved techniques," Abbott said. Electronic mechanization, he added, will have its effect upon the size of the labor force "but need not result in wholesale dislocation of employes."

Implementation will come gradually and any reductions in work force can be absorbed by attrition, particularly in view of the growth of the industry, Abbott believes. Also, the electronic mechanization will create new jobs in connection with the planning, programming and operation of the machines.

When the more advanced data processing systems come into airline use, possibly in five to eight years according to Abbott, they will take over the inventory function now performed by Reservisors and Availability Panels. He



AMERICAN AIR LINES RESERVISOR (above), automatic reservations computer which keeps running inventory, will be replaced with unit which has 12 times greater capacity.

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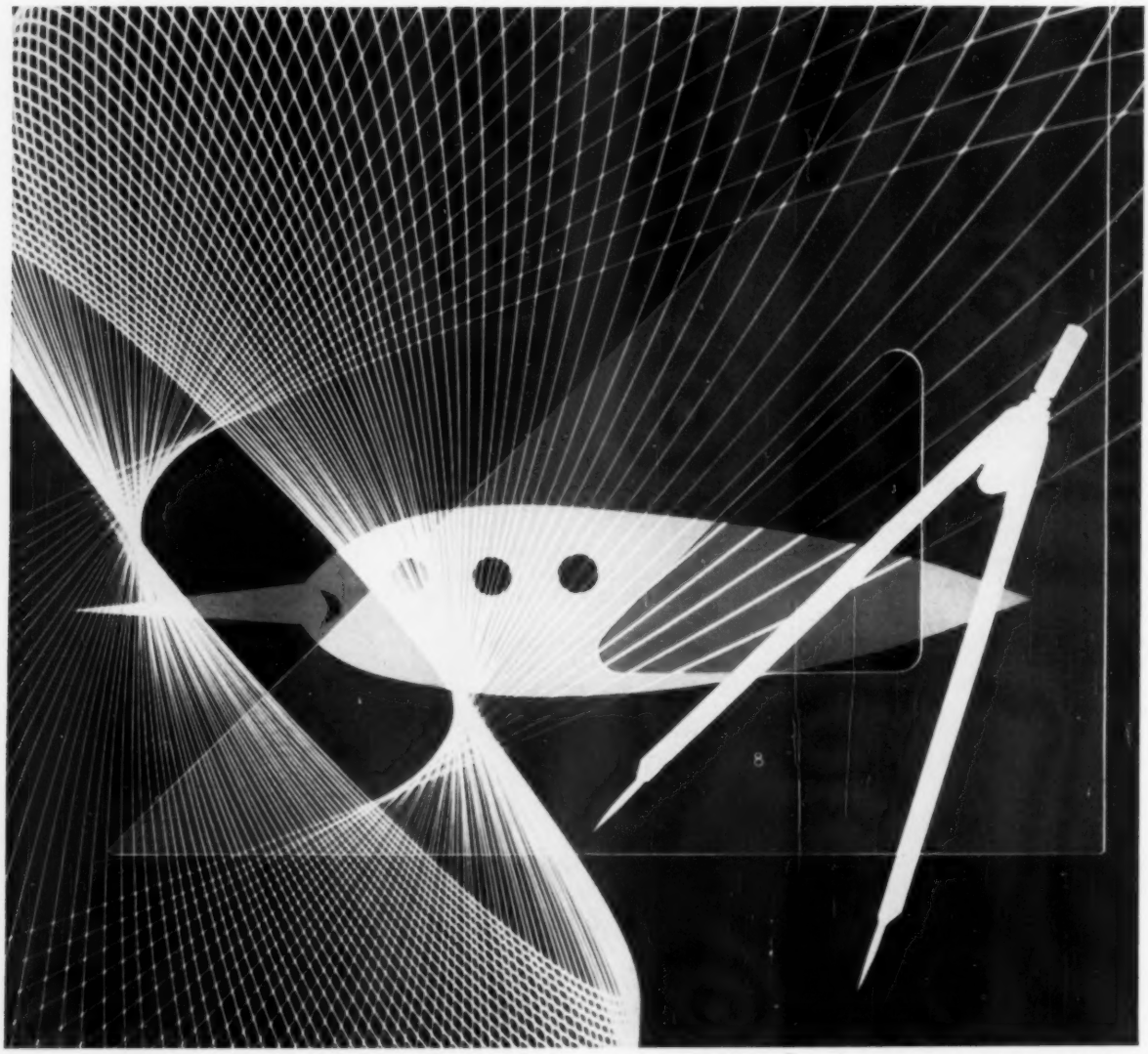

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does not believe, however, that this is any reason for airlines to hold off buying the latter, since they will have more than paid for themselves by the time they are replaced.

He backs up his statement by citing American figures that the original Reservisor not only has paid for itself in five years but now nets the carrier about 10% of its original investment annually.

As the airlines expand their individual electronic inventory systems and then interconnect them, there will be minor compatibility problems, particularly if the systems are purchased from different manufacturers. However, Abbott does not believe this is sufficient reason to force airline industry standardization on machine design. Because inventory/availability machines work in relatively simple codes, it is comparatively easy to design an "electronic interpreter" that will enable one airline's computer to "converse" with another airline's machine.

Compatibility, however, will be a more pressing problem in the ultimate system because it deals with much more complex information than mere inventory. For this reason it will be desirable to standardize on the characteristics of the basic equipment, on "machine language" and its logical alignment.

For instance, a particular code letter, like "B" might mean "book passage for . . ." to the computer when the "B" is the first character in the message, but the same letter might represent the initial of the passenger's surname in the body of the message.

Agonizing Reappraisal

Preparation for the day of fully automatic data processing will require "a thorough review of the principles and practices which underlie airline message construction and could imply that rather sophisticated changes must be made to the standard rules which govern," Abbott told the ATA Reservations Committee. "These seemingly painful re-explorations of basic principles are typical (of what is required to prepare) . . . for electronic data processing," Abbott added.

In preparation for its experiment at Buffalo, American has undertaken an extensive evaluation of its reservations procedures and message coding. Interestingly, American found there is a striking similarity between good manual procedures and those which can be readily followed by electronic data processing machines, AA's W. G. Cumber told the ATA meeting.

American selected Buffalo—which boards around 1,000 passengers a day, many of them for connecting flights out of New York—as a proving ground be-

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cause it offered sufficient traffic variety and quantity. Buffalo's traffic flows, revenue, statistics, operating records and reservations office work-flow charts were then studied.

Objectives of this study were to develop techniques which would:

- **Increase accuracy** of maintaining records and transmitting data.
- **Mechanize routine** repetitive clerical tasks.
- **Speed processing** of reservations data, particularly between cities.
- **Reduce volume** of work in progress (what engineers call "the float").

To meet these objectives, and to permit the use of currently available data processing machines, American has developed what it calls a "machineable reservations record." This is a modified version of a conventional punch card which the reservations agent fills out in pencil or ink to record the requested space, date, flight number, destination, passenger name, contact point, etc. Once this is done, no further manual copying or duplicating is required.

The card is then given to an operator who punches it to correspond with the handwritten information. Up to seven flight segments can be written on the card, and up to four segments can be punched into it. If there are more than four segments, a second, or "trailer," card is used.

Automatic Message Preparation

When the punched card is inserted in a modified version of a standard business machine, special adaptors, called "translators" and "analyzer networks" determine which outlying stations need the information and what messages should be sent to each station involved.

For example, assume the passenger has requested space on flight No. 781, Buffalo to Chicago on April 1, with a stop-over and departure on the following day on flight No. 23 for Dallas. The machine-analyzer-translator combination determines that a message should be sent to Chicago, requesting space on flight No. 23 for April 2. The machine automatically punches out a teletype tape, addressed to Chicago, requesting such space, giving the passenger's name, date of arrival, and other such pertinent information.

The punched tape then feeds into the American Airlines teletype equipment, automatically transmitting the message to Chicago's reservations center, where it comes out in the form of punched tape and typewritten copy.

If the passenger were flying to Des Moines, via United, instead of Dallas, then American's Chicago reservations center would manually feed the taped message it received into its interline teletype connection to United's Chi-

cago reservations center, where it would again produce both tape and typewritten (hard) copy.

Although machines can outperform humans on routine operations, the smallest deviation from standard routine can throw them for a complete loss, whereas the human mind can handle such a situation without strain, Cumber pointed out.

Demanding Machine Logic

For this reason, every subsection of every reservations rule and procedure must be carefully scrutinized for clarity and logic, if it is to be followed by electronic data processing machines which rigidly adhere to their basic principles of logic. In programming its small Buffalo computer, American discovered that certain of its procedures actually require deviations from simple straightforward logic.

This means that individual airline reservations procedures must not only be uniform and logical within themselves, but must also be compatible with the procedures of other airlines, to permit cross-feed of data from one line to another. While this will be a problem, it is not an insurmountable obstacle, since the carriers already have adopted certain standardized procedures and codes for present interline messages, through the ATA Reservations Committee.

To Meet The Challenge

"The struggle for improved methods is still with us," Abbott told the ATA Reservations Committee. "As markets expand, flying times decrease and profit margins narrow, the accent on ingenuity in this area will increase. Rapid strides must be made to keep pace with the tempo of the industry and to protect the tradition of personalized service on a mass basis.

"This challenge can best be met by the successful application of electronics (data processing) to our business," Abbott said. Judging from the reactions and questions of other airline reservations people present at the meeting, Abbott believes that many of them share his strongly held conviction.

New Tester Permits Rapid Radar Check

A new tester that enables airlines to check the performance of their weather radars in less than one minute has been developed by The Narda Corp, Mineola, N. Y.

The small, light Narda tester (it can be operated by relatively inexperienced personnel) checks the performance of both the radar transmitter and receiver and reportedly can spot performance degradation of the order of one or two

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decibels. The unit operates in conjunction with the firm's Model 833 echo box, a high-Q resonant cavity which is coupled to the radar transmission line and provides an artificial target.

During the transmitting cycle, the pulse is stored in the echo box, after which the energy is returned to the radar much as it would be from a target. The time interval between the beginning of the transmitted pulse and the point where the signal on the radar PPI scope just disappears, called "ring time," is a measure of the set's performance. Any decrease in transmitter power or loss of receiver sensitivity will result in a shortening of the "ring time." Small changes in "ring time" can be resolved by the tester without requiring precise time base measuring equipment, Narda says.

The present weather radar pre-flight tester is designed for use with C-band sets, but it can be adapted for use with X-band sets, the company says.

FILTER CENTER

▶**Preferred Tubes For Missiles**—The Defense Department has released a list of preferred receiving types tubes which should be used wherever possible in guided missile avionic equipment. Objective is to limit the number of tube types in use. The list, which will appear in the forthcoming MIL Standard 200-C, "Military Standard for Electron Tubes," includes the following: 5647, 5896, 5718 (6221), 5703WA, 5719 (6222), 5744WA, 6533, 6021, 6112, 5840 (6223), 5702WA, 5899 (6225), 5636, 5784WA, 5639, 5902, 5641, 5644, 5783WA, 5643, 6080WA, 6094, 6203, OA2WA, OB2WA, 5727/2D21W.

▶**Transistor Sales Up**—The transistor industry sold nearly three times as many transistors in 1955 as in the previous year, according to figures released by the Radio-Electronics-Television Manufacturers Association. Factory sales for 1955 totaled 3.6 million units, valued at $12.3 million, compared to only 1.3 million units valued at $5.1 million in 1954.

▶**"Scatter Communications" Grows**—Despite the fact that "scatter communications" is a relatively new technique, it is fast becoming a significant factor in communications business. For example, the Air Force has spent approximately $28 million in scatter communications facilities for use in the Arctic regions, and will invest further to extend the present Distant Early Warning radar line. Approximately $16 mil-

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lion of the USAF funds have gone into tropospheric scatter communications, with the balance for ionospheric scatter communications.

▶ **Portable Microwave Relay**—A new microwave relay station, which weighs only 1,900 lb. including a 100-foot telescoping magnesium tower, making it transportable by helicopter, has been developed by Motorola, Inc., under Rome Air Development Center sponsorship. The tower, which telescopes into a 12-foot package, can be erected by a crew of eight in less than an hour, and the station can be put into operation within two hours, the Air Force says.

NEW AVIONIC PRODUCTS

Components & Devices

• **Miniature pulse transformer,** Type PT-100, with 9-pin plug-in base, provides four windings, 100 turns each. Resistances of windings are 3½, 4, 4½,

and 5 ohms (d.c.). Unit measures ¾ in. dia. x 1¼ in. long, weighs 0.6 oz. It is designed for airborne use. Berkshire Laboratories, 598 Bank Village, Greenville, N. H.

• **Miniature crystal filter,** Type 44F, for use in UHF/VHF FM receivers, reportedly has high selectivity which eliminates need for multiple conversions. Filter is available with a center frequency of 10 to 20 mc., bandwidth (at 6 db. attenuation) of 20 to 50 kc., insertion loss of 6 db. maximum, and passband response variation of 1 db. maximum. Shape factor is quoted at

1.7:1 maximum and ultimate attenuation at 90 db. minimum. Frequency shift is quoted at less than 0.005% from −55C to 85C. Unit is hermetically sealed, requires no alignment, and reportedly meets the MIL-E-5422 shock and vibration requirements. Hycon Eastern, Inc., Communication Filter Div., 1360 Soldiers Field Rd., Boston 35, Mass.

• **Precision miniature power resistors,** Type RS, are now available in new sizes and wattage ratings. Two-watt units are available with maximum resistances of 4,400, 6,300, and 6,500 ohms, in diameters of ⅛ and ¼ in.; new 5, 7, and 10 watt units are available in resistances of up to 15,500, 22,000, and 55,000 ohms, respectively, in diameters of ⅛ and ¾ in. Resistors are sealed in silicone, have temperature coefficient of 0.00002/deg. C., a dielectric strength of 1,000 v. a.c., and come with tolerances of 0.05% to 5%. Bulletin R-23B gives full data. Dale Products, Inc., Columbus, Nebr.

Microwave Devices

• **Traveling wave tube amplifiers,** Models 492A and 494A, cover the bands of 4 to 8 kmc. and 7 to 12.4 kmc. respectively. Model 492A provides 30 db. gain, 10 mw. output, and 15 millimicrosecond rise time. Model 494A provides 25 db. gain, 5 mw. output, 15 millimicrosecond rise time. Price is

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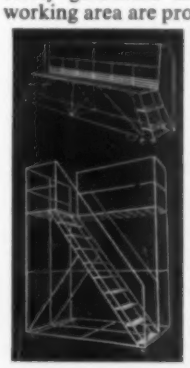

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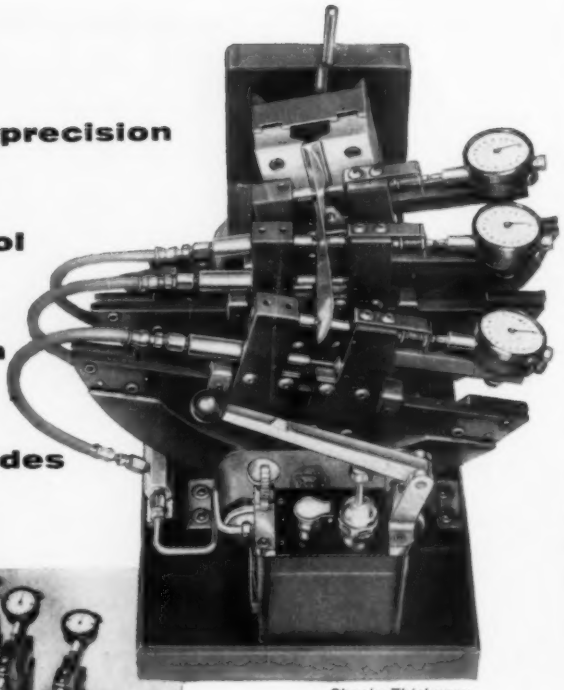
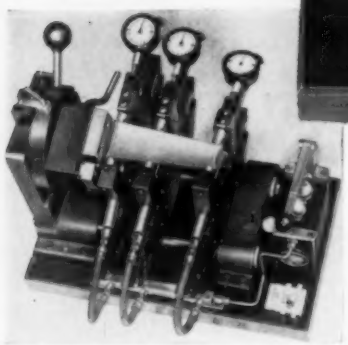


Checks Thickness



Checks Chord Width

THE WINSLOW STANDARD MULTI-JET GAGE

- choice of 9 check features
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- perfect repeating
- no marking of part
- faster production
- quicker delivery; lower cost
- no maintenance
- less-skilled operators

Here is the answer to specific thickness control on a mass-production basis... more accuracy—faster gaging—lower investment—lower operating costs. This versatile new gage can be supplied to give every known check on edge thickness and pitch, on chord width, on valuable miscellaneous features. You solve the accuracy problem with Winslow's simplified, rugged construction that preserves perfect alignment and the Winslow-engineered self-contained hydraulic system that guarantees equal pressure at all check points. You get faster production—up to 10 times as fast as other gages—as high as 600 per hour. Winslow's patented new design and assembly from precision-built interchangeable components mean lower original cost, with delivery in as little as three weeks, and quick, economical up-dating when your part changes. You save on the use of less-skilled labor. You save on maintenance—normal service wear is negligible for years.

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WINSLOW PRECISION ALWAYS

first name in precision control

$1,500 f.o.b. factory. Application data is available. Hewlett-Packard Co., 275 Page Mill Road, Palo Alto, Calif.

• **Magnetron load isolators,** Series S10, for S-band use, provide reverse attenuation of 10 to 30 db., with corresponding insertion losses of 0.5 to 1.5 db. Units can handle 500 kw. peak power and 250 watts average without external cooling. With air or liquid cooling, power rating can be increased substantially. Litton Industries, Components Div., 336 No. Foothill Rd., Beverly Hills, Calif., and 215 So. Fulton Ave., Mt. Vernon, N. Y.

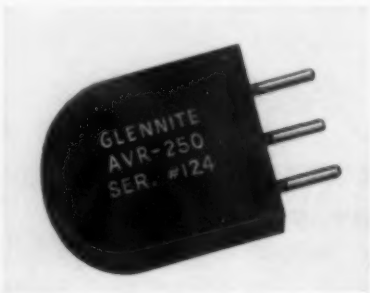
• **Traveling wave tube amplifier,** Type HA-5, a low-power L-band unit, operates from 1 to 2 kmc. without any electrical or mechanical adjustments. Grid control is provided for variable gain

and power output. Gain is quoted at 30 db., and output at 10 mw. Unit requires a 300 Gauss field and 250 v. regulated power supply. Huggins Laboratories, Inc., 711 Hamilton Ave., Menlo Park, Calif.

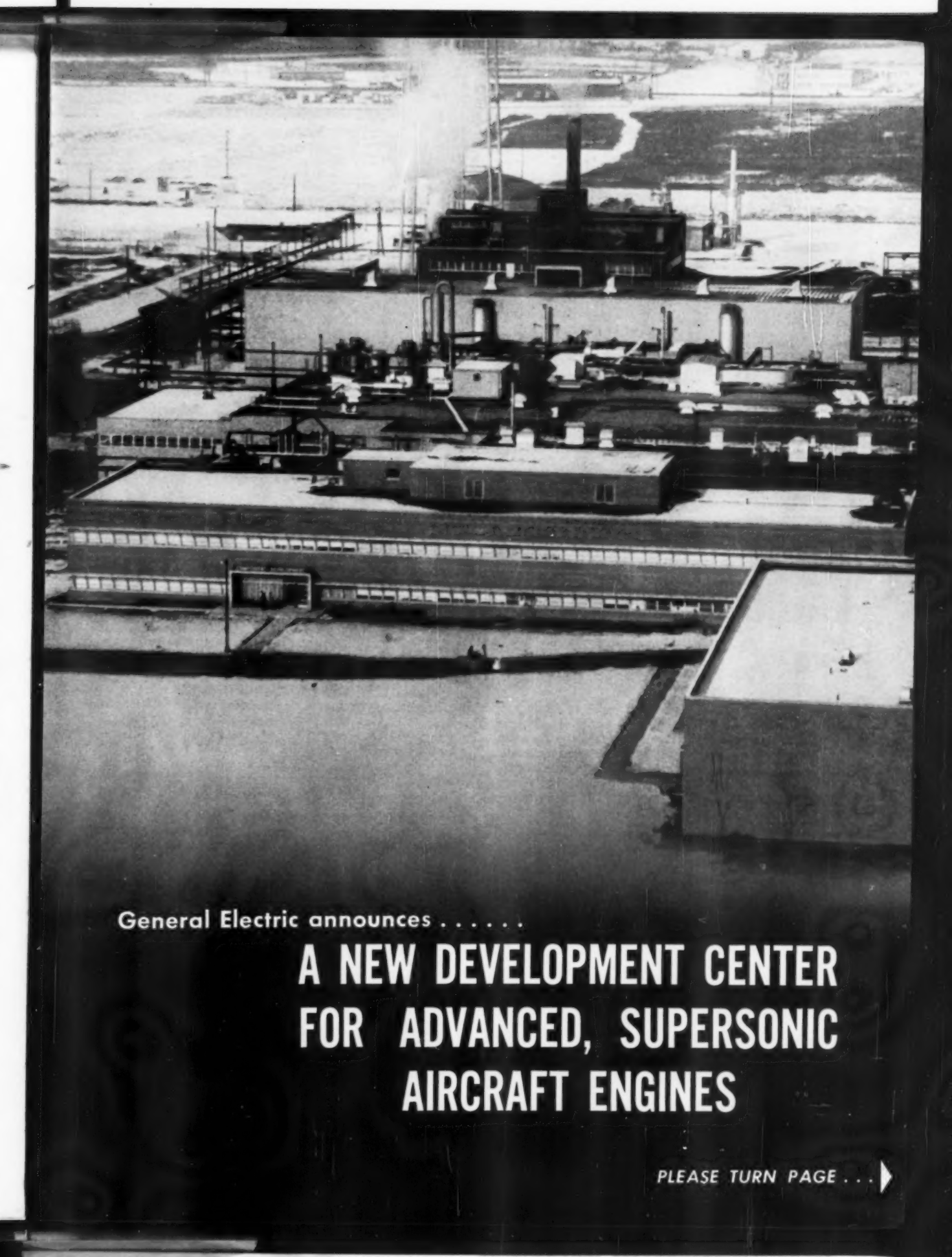
Instrumentation

• **Floated rate gyro,** available in new line with angular momentums up to 10^6 gm. cm^2 per sec., weighing no more than 2 lb. and measuring $2\frac{1}{2}$ in. dia. x $4\frac{1}{4}$ in. long, maximum. Viscous-shear type damping is thermostatically controlled. Gyromechanisms, Inc., Halesite, N. Y., or 11941 Wilshire Blvd., Los Angeles, Calif.

• **Sub-miniature accelerometer,** Type AVR-250, for measuring low-frequency vibrations up to about 300 cps., is designed to operate with standard carrier systems (500 to 1,500 cps.). Response is



flat within 3% over useable range, and sensitivity is 30 mv. full scale per volt input. Unit occupies only 0.09 cu. in. Gulton Mfg. Corp., Metuchen, N. J.

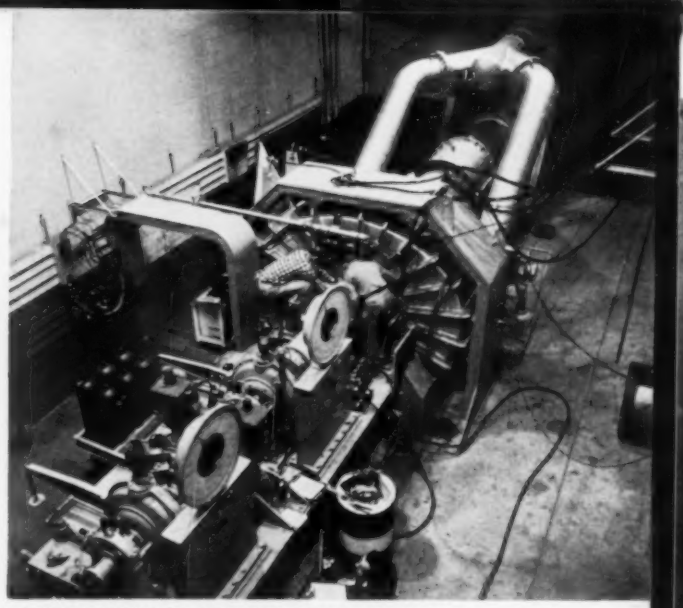


General Electric announces . . . . . .

A NEW DEVELOPMENT CENTER FOR ADVANCED, SUPERSONIC AIRCRAFT ENGINES

PLEASE TURN PAGE . . .

SEA LEVEL AIR PRESSURE CAN BE INCREASED 20 TIMES inside new Component Development Lab. Scale model of Lab's extensive air supply system is examined by D. Cochran (right) AGT Development Dept. Manager, and B. W. Bruckmann.



POWER OUTPUT OF ADVANCED TEST TURBINES is measured by these two 6000-hp 12,000-rpm dynamometers (foreground). These machines allow turbines to be tested without air compressors, cutting development time and cost.

HIGHLY ADVANCED PRIVATELY-OWNED FACILITIES IN FULL OPERATION TODAY

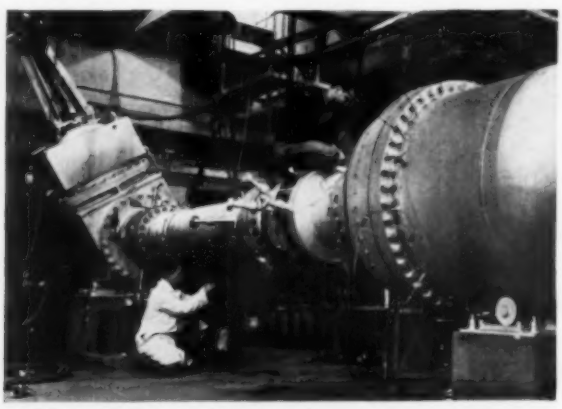
General Electric has provided aircraft propulsion facilities valued at $100 million—*with emphasis on development*

Fully equipped for studies on all types of propulsion systems, including advanced supersonic jet engines, the Aircraft Gas Turbine Division's new development center at Evendale, Ohio, is a typical example of the continuing G-E investment in the future of American aviation. Already in place to help G.E. speed propulsion progress are Company-owned facilities with a replacement value of $100 million.

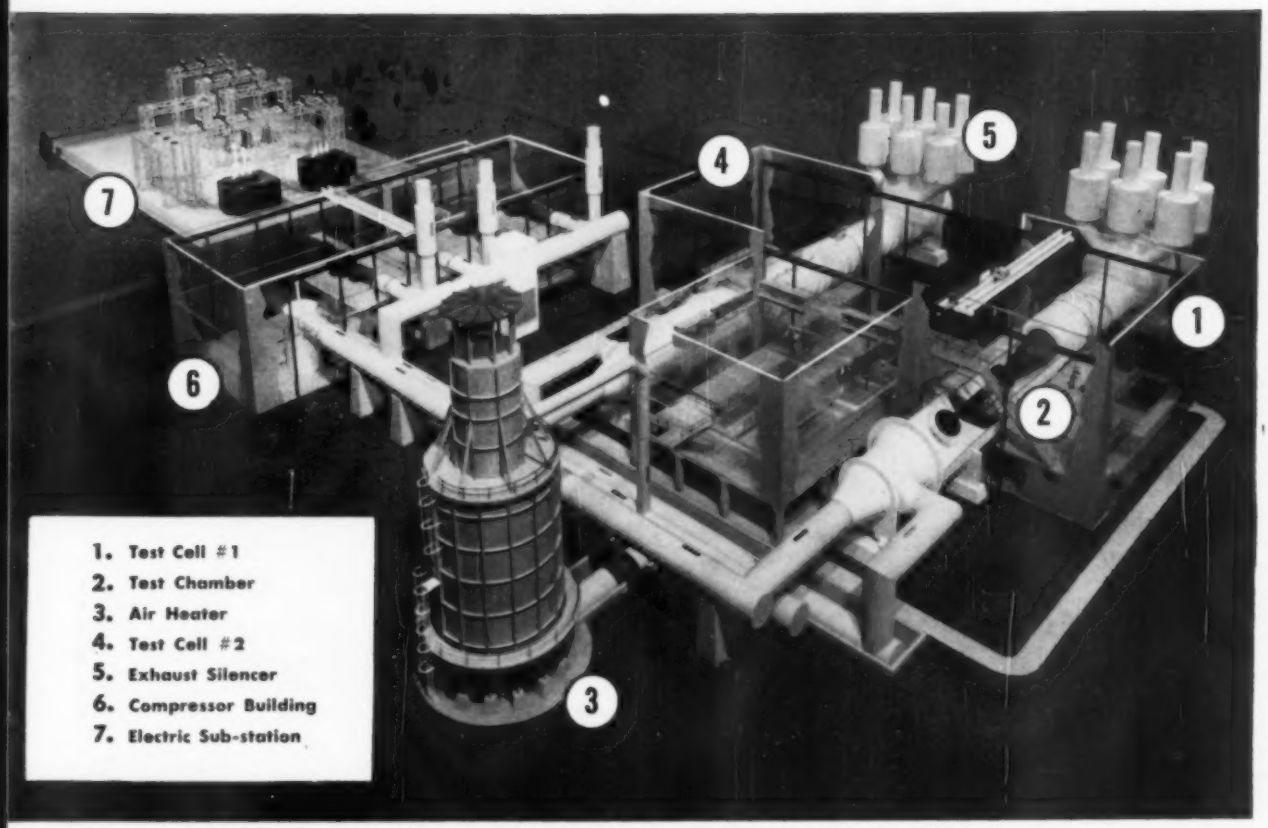
The center at Evendale contains the newest equipment—the most advanced of its kind—for investigation of aerodynamic and mechanical engine component designs . . . materials . . . fuels . . . combustion and ignition. Begun in 1950, it is now in full-scale operation. Already employing over 1000 highly-skilled technicians, the center's final size will be determined only by future powerplant needs of the Armed Services and this nation's airframe companies.

Efficient, on-time development calls for *continued* expansion. Already scheduled is a new Supersonic Propulsion Facility, plus a new testing area for super-

NEW COMPUTATION BUILDING (background) contains huge new electronic computers which permit rapid, low-cost appraisal of developments before they reach G-E drawing boards.



SUPERSONIC COMBUSTION TESTS provide valuable performance data on latest engine components. System of pipes duplicates air intake and exhaust conditions found in actual flight.

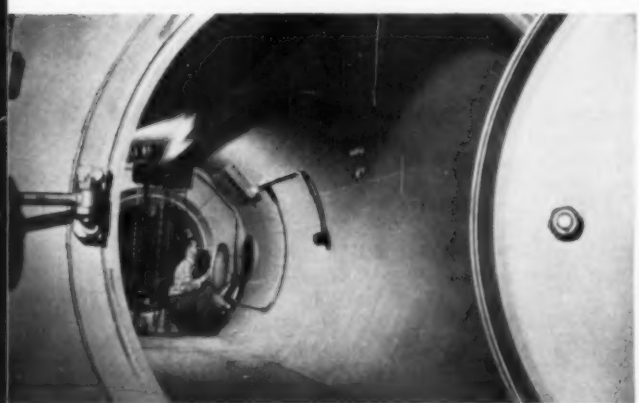


MOST ADVANCED PRIVATELY-OWNED ENGINE TEST FACILITY IN THE NATION, to be built in 1956–57, will simulate Mach 3.5 at 60,000 feet. Full-size engines will be evaluated at "in-flight" speeds as high as 2300 mph.

sonic rocket and ram-jet engines.

When these G-E facilities are completed, they will provide AGT with the most advanced, privately-owned supersonic development tools. Propulsion research and development work done at Evendale will continue to be supported by the Company's Aircraft Gas Turbine Laboratory at Lynn, Mass., and by the G-E Research and General Engineering Laboratories at Schenectady, N. Y. General Electric Company, Cincinnati 15, Ohio. 235-2

NEW SPECIAL FUELS FACILITY helps G-E chemists explore possibilities of new fuels for tomorrow's planes and engines.



20,000 RPM SPEEDS AT 4500 HP test efficiency of new jet engine compressors in these test tanks. Compressors are tried out under both sea level and high altitude operating conditions.

HIGH TEMPERATURE ALLOYS for items like engine gears, bucket blades, and turbine wheels are investigated in this modern, well-equipped alloy foundry. Furnace at right produces molds for new jet parts.

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ARTIST'S CONCEPTION of Bell Aircraft's proposed 25-passenger, triple-turbine helicopter with markings of New York Airways.

Bell Reveals Turbine Helicopter Plans

Triple-engine craft to carry 25; New York Airways shows strong interest; military support is sought.

By Evert Clark

Washington—New York Airways, Inc., is negotiating with the Bell Aircraft Corp. for a 25-passenger, triple-turbine helicopter which Bell says it can produce in 36 months or less if it can interest one of the armed services in the project.

Bell vice president for helicopters, Harvey Gaylord told AVIATION WEEK the proposed helicopter "is not a paper machine." He said "most of the critical parts of the design" already are fairly well proven by other work Bell has done.

The bell copter, which would fly at 120-125 mph., is designed with the Lycoming T53 turbine engine in mind but could take the more powerful General Electric T58. The present T53 is rated at 770 horsepower and the C model will be rated at 890. The Bell machine would fly with the engines derated power from military requirements.

NYA President Robert L. Cummings Jr., who has kept a close watch on helicopter development here and abroad for some time, indicated he feels the Bell proposal may be the answer in the search for a machine that will operate with direct costs somewhere in the vicinity of 10 cents per available seat-mile.

Gaylord, Cummings and members of their staffs held talks—described as "the early stages of negotiation"—in Bell's offices here last week.

Advantages Listed

The new helicopter would include these advantages:

• **A very high** ratio of useful load to empty weight, compared to existing helicopters, because of its turbine engines. A turbine weighing about half as much as a piston engine can deliver the same horsepower.

• **Greater safety.** One engine could fail completely, and the aircraft would still have satisfactory power.

• **Relatively indiscriminate loading.** The Bell copter has twin rotors, placed almost at the extreme front and rear of the craft, making the all-important center of gravity much easier to control than it is in the single-rotor configuration

• **Easier maintenance.** The three engines, gears, rotor heads and the drive shaft—which is located outside the passenger cabin—are easily accessible. External fuel tanks and the lack of a tail rotor also decrease the maintenance problem and increase safety.

Bell's machine would have a 50-mile commercial range. For all practical purposes that means an actual one-way range of about 125 miles. On a 50-mile trip between airports or from an airport to a suburban heliport, no refueling is required before the return trip can be made, and there is a safety fuel reserve of around 20 or 25%.

NYA's Views

The relatively young New York Airways, still operating with a heavy public service pay from the government, hopes to near the break-even point by 1960 (AW Mar. 5, p. 76).

President Cummings says that equipment still is the commercial helicopter operator's major problem, and he regards the Sikorsky S-55s he has now and the 12-passenger S-58s he will get this year as stop-gap aircraft.

Cummings announced almost a year

ago (AW May 23, 1955, p. 107) that he considered a three-turbine helicopter desirable for successful high-frequency schedules. At that time he had scaled down his idea of the ideal short-range helicopter to 20 passengers. Now Bell says its machine could carry 25.

NYA now operates an every-hour-on-the-hour shuttle service between La-Guardia, International and Newark airports, as well as service to points in New York, New Jersey and Connecticut.

Cummings would like to replace the train-like, on-the-hour service with heavier schedules on which "you would load them like a streetcar" and have them leave every few minutes. He is confident that swift, frequent, reliable service would bring such a demand for helicopter space that reservations could be done away with and provide more competition for surface transportation.

NYA, which introduced the first regularly scheduled helicopter passenger service and the first scheduled helicopter freight service in the world, has taken a pioneering look at all the existing and proposed helicopters it could in this country and in Europe in recent months, and has kept in close touch with the other operators' needs.

Jack Gallagher, NYA's operations manager and chief engineer, has flown most of them. He and Cummings agree that the Bell proposal is the most promising yet and Cummings believes there would be an immediate commercial market for up to 200 of them.

But both NYA and Bell agree that commercial helicopter operators will not get the 25-passenger craft "or anything comparable to it" without military help, because of the high cost of development.

Bell calls the proposed helicopter "a composite of what the commercial operator want and what the military needs" in a turbine copter.

Bell's Gaylord points out that the advantages to a commercial operator—a good useful load/empty weight ratio, lower maintenance cost and time, higher degree of safety and stability, etc.—are the same ones the military wants, and that the larger the civilian helicopter fleet, the larger the reserve "fleet in being" if war comes—either for direct military use or for civil defense transport and rescue. Gaylord pointed out that the helicopter would not have been the hero of the Korean war had there not been both civil and military demand for and development of it beforehand.

Gaylord believes that work now being done on noise problems involving engines and rotors will progress to the point that noise would not be a major problem by the time his 25-passenger aircraft rolled off the production line.

As for a production date, Gaylord says the armed services could have a certificated 25-passenger Bell copter in three years or less if they would allow some of the first production to go the commercial operators.

If such an arrangement is made, NYA is quite likely to be the first customer in line.

Initial F.1 Sale Reported by Frye

The newly-formed Frye Corp., of Fort Worth, Tex., announced last week that it has received initial orders for six short-haul, four-engine F.1 transports (AW Sept. 26, p. 108) from two Alaskan airlines.

The announcement said Northern Consolidated Airlines, Inc., of Anchorage, has placed an order for three of the large-capacity aircraft and taken an option on two more. The other three have been ordered by Wien Alaska Airlines, Inc., of Fairbanks.

Jack Frye, company head and former president of Trans World Airlines, said he hoped to have the prototype of his "DC-3 replacement" aircraft flying by the end of the year with actual deliveries beginning in mid-1957. At present, final work on the mockup is being completed.

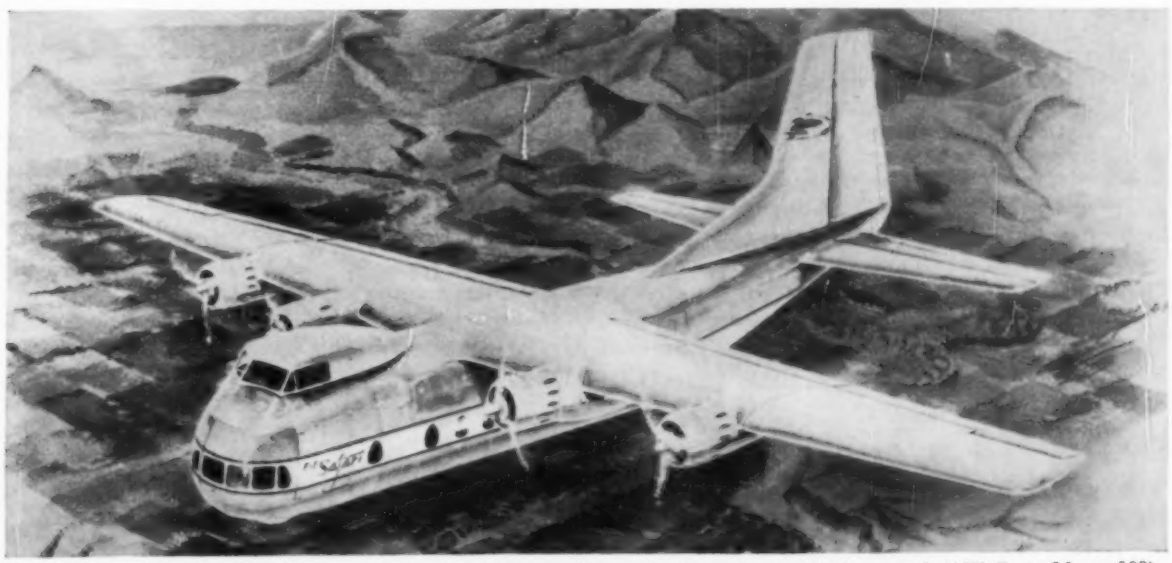
Frye declined to reveal the purchase price stipulated in the contracts with the Alaskan airlines but said final specifications, performance and operating costs will be announced within "the next three weeks."

He said the F.1, which has been formally titled the F.1 Safari, will be offered with either fixed or retractable landing gear and in four different configurations:

- **All-cargo.**
- **All-passenger.**
- **Cargo-passenger.**
- **Executive-utility.**

Earlier specifications for the aircraft called for a cruising speed of 150 mph., passenger capacity of between 50 and 70 persons, a normal gross weight of 30,000 lb. and a takeoff distance over a 50 ft. obstacle of 900 ft.

Shortly after the formation of his company, Frye also announced that the F.1 would sell for approximately $350,000. Power for the aircraft will be supplied by four Pratt & Whitney S1H1-G Wasp engines.



NEW VERSION of F.1 features full nose windows for "Panoramic Lounge," differs from original proposal (AW Sept. 26, p. 108).

20th anniversary of an idea that's earned a lot of credit

In line with its pledge to provide the finest in air travel, American has been responsible for many of the industry's most important innovations. Of these, one of the most successful was the Air Travel Plan which was first introduced by American in 1936 to extend credit to air travelers.

It came as a great convenience to businessmen and developed a new acceptance of air travel among those firms who had not previously encouraged their personnel to fly. Today the air credit card is so widely used that at the close of 1955 there were 68,000 business firms using the plan throughout the United States and 722, 310 individual cardholders who purchased over $300,000,000 worth of air transportation during the year.

American Airlines is proud to have pioneered the Air Travel Plan which has contributed so substantially to the growth of air transportation.

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CAB-ATA Relations Target of Inquiry

Washington—The "close and continuous" relationship between the Civil Aeronautics Board and the Air Transport Assn. is a major target of the investigation of the House Judiciary Subcommittee on Monopoly Practices, headed by Rep. Emanuel Celler (D.-N. Y.).

Celler declared one aim is to ascertain whether this relationship involved "conspiracy" resulting in the discouragement of competition in air transportation.

CAB Chairman Ross Rizley protested that "no conspiracy is involved—it is a matter of philosophy." Although he believes in strong competition in air transportation, he said he respects the right to opinion of conservative CAB members" who are attempting in every shape, fashion and form from keeping (cases promoting competition) from becoming effective." Pointing to several decisions increasing competition during his year on the Board, he declared: "It has been a terrible battle to get them out."

CAB member Harmar Denny's position on the CAB staff's recommendation for a general Board investigation into reduced fares—vigorously opposed by scheduled airline interests—highlighted sessions. Denny reversed his position, and cast the deciding vote against the investigation, after a conference with Stuart Tipton, then counsel and now president of ATA. Denny reported that the conference covered the air transport situation in general, and that the investigation was not discussed.

Denny's Reversal

On Apr. 10, 1953, three days after being sworn in as a CAB member, Denny supported the investigation "because it sounded as though it might be a good thing." At a Board meeting on Apr. 27, Denny noted his conversation with Tipton, voted against the investigation, and proposed instead a staff study of airline rates.

Celler pointed out that Tipton is "a registered lobbyist" for the airlines and "most interested in having the investigation dropped." Denny insisted that Tipton "in no way tried to influence me" and that he "certainly did not discuss the merits of the case" with Tipton. He said that during the interval between his two votes he made an effort to get as many facts and figures as possible.

Celler then made a persistent effort to get CAB member Joseph Adams to state that Denny had attributed his changed position to Tipton at the Apr. 27 Board meeting. Even when put under oath Adams declined to answer: "I don't think it is either incumbent or proper for a member (of CAB) to state what was said when the person is present and able to state it himself."

After a brief recess, requested by CAB Chairman Ross Rizley, Rizley said that although Board members did not want to be in contempt of Congress, "there is considerable doubt" as to whether Board proceedings should be subject to Congressional questioning. He asked a "few days" for Board consideration of the issue.

Adams reported that he had had office conversations with Tipton and other members of the Board and did not think that there was "anything fundamentally improper on this."

Fares, PanAm Discussed

Other points developed at the hearings were:

• **The $1-a-ticket** fare increase granted in 1952 has given the domestic trunks an estimated $84 million additional revenue. Denny said the Board may reconsider this increase "almost anytime."

• **Celler criticized** the Board for not having yardsticks for determining airline profits and allowing the carriers in excess of 8% profit on investments without taking steps to reduce fares to the public. From 1950 through 1955, domestic trunk profits were between 10.6% and 14.9%, it was reported. For the year ended June 30, 1955, it was estimated that the trunks' profits, after taxes, would have been $30 million less had a maximum 8% profit been allowed.

• **Rizley concurred** with Celler that Pan American World Airways is "absolutely dominating the international scene . . . I agree that any time that it should appear that any airline or any other business is dominating the industry that somebody ought to look into it." Celler stated that the growth of PAA during the year ended Sept. 30, 1955 of 62 million revenue ton-miles "is equal to the total international traffic of Braniff, Northwest, and Delta combined."

• **Rizley concurred** with Celler that the authority of the International Air Transport Assn. to license general travel agents to handle airline tickets and regulate the fee "is contrary to the intent of Congress and to the statutes." Pointing out that travel agents handling nonsked business are "black-balled" from getting scheduled airline business. Celler objected that the purpose of IATA licensing is "to hamper substantially the nonsked operations."

• **Irving Roth**, chief of the CAB rates division, gave his opinion that International Air Transport Assn. is a "cartel."

Rizley agreed that CAB's action in going along with a 10% increase in international first-class fares for a temporary period from Apr. 1 to Sept. 30 amounted "to a capitulation to all the airline." He explained that the minutes of the IATA meeting at which the increase was agreed upon, giving the whys and wherefores, was not submitted to CAB until Dec. 30. Pressed for time and warned of grave repercussions if the increase were not permitted to go into effect by U. S. airlines, foreign airlines, and governments, he said the Board decided to approve a temporary arrangement.

It was estimated that the 10% additional would mean $3 to $4 million additional revenue annually for the North Atlantic operations of PAA and Trans World Airlines, combined.

• **Rizley confirmed** that it was at the suggestion of the White House that CAB stayed its order expanding international nonsked operation. He emphatically denied Celler's suggestion that the White House action was "due to Pan American influence." Rizley said the White House simply pointed out that the international aspect warranted White House review.

• **The new "supplementary"** operations authorized in CAB's recent irregular case decision, Rizley declared, "will not afford any substantial competitive threat to the certificated industry." The services are to be "supplementary," rather than "competitive," he emphasized.

The nonskeds played a "very prominent part in promoting coach service," Rizley declared.

U. S. and Britain Agree On Jet Engine Standards

Washington—The United States and Great Britain have tentatively agreed on uniform standards in testing and certifying jet engines manufactured in each country. The proposed standards for reciprocal certification are to cover both civil and military models of turbine engines.

Differences over jet engine standards, which arose as exceptions to a previous U.S.-U.K. certification agreement, precluded any reciprocity and hampered trade of aircraft engines between the two countries. Arrangement for the new agreement was worked out in Washington at a week-long meeting of U.S. industry and government officials and British representatives. Chairman of the conference was Steven Rolle, chief of the powerplant branch of the Civil Aeronautics Administration.

reputation seems...

A reputation can be purchased or promoted.
It may flower fleetingly . . . and as fleetingly disappear. Character is what we are . . .
and what we are evolves slowly and surely through the years.
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we are that much *bigger* in a priceless and enduring sense.

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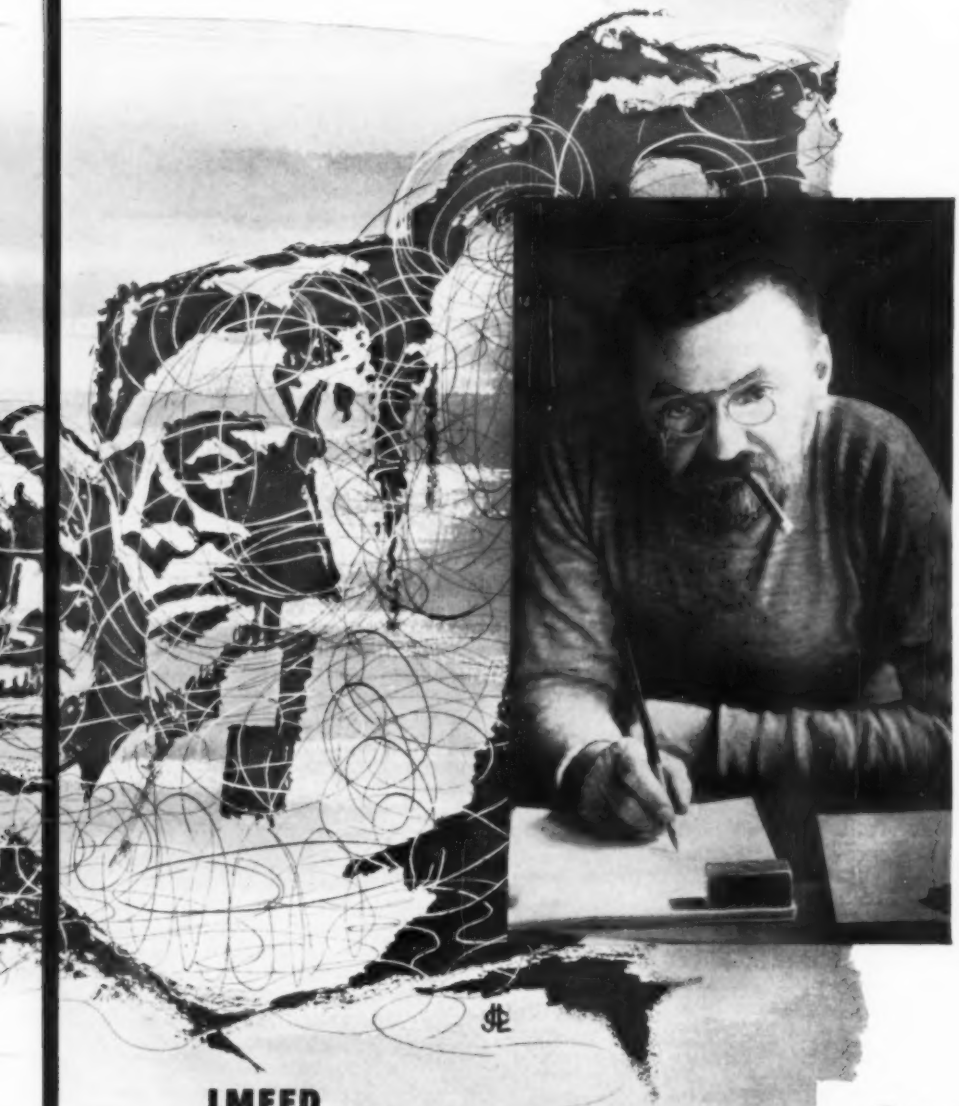
Today, what General Electric *is* makes us an accepted leader in the field of electrical and electronic manufacture. Indeed, ***Progress is our Most Important Product.***

...character is!



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ALPA Safety Forum:

Traffic Control Called Critical Problem

By Preble Staver

Chicago—Outmoded methods of air traffic control and inadequate airports are two of the most critical problems facing civil aviation today, according to airline pilot safety experts who met here for the Air Line Pilots Assn.'s fourth annual Air Safety Forum.

They said the situation is "not only a safety problem but an economic one as well" and has spurred ALPA into stepping up its air safety activities to an all-time high.

T. G. Linnert, head of ALPA's Engineering and Air Safety Department said "the industry's expansion and its recognition of the value of the airline pilot's contribution has also resulted in the need for ALPA's safety activities to expand."

ALPA has over 2,500 pilots actively engaged in air safety work, ranging from accident investigation to the development of flying aids, he said. It is working with 26 major organizations on air safety in government and industry. The association also has aircraft evaluation committees currently studying the Boeing 707, Douglas DC-7C and DC-8, and Lockheed Electra and 1649A.

Expansion Needed

"Even this broad program," C. N. Sayen, ALPA president said, "is going to have to be expanded and accelerated because the pilot's obligations go beyond mere job performance and must include assumption of active participation and responsibility in aviation planning, research and development to provide the tools with which to work with the highest degree of safety."

The more than 150 pilot, industry and government experts were presented the following five-point program aimed at solving today's growth problems:

- **A more efficient** system of air traffic control on the ground and in the air.
- **A planned airport** expansion and development program to meet the jet age.
- **Better visual** and navigational aids, such as approach lights and runway markings, for all-weather flying.
- **Airborne radar** and proximity indicators for weather and collision warning.
- **Cockpit instrumentation** that will give the pilot a precise indication of a plane's position at all times.

A six-member panel on Evaluation of Air Traffic Control Requirements—Present and Future, agreed that air traffic congestion is a common problem but disagreed on the order in which potential solutions should be approached.

Capt. J. D. Smith, panel chairman and an ALPA regional air safety chairman, called on the Civil Aeronautics Administration to fully accept its statutory responsibility for effecting traffic control. He said "we knew nine years ago how to satisfactorily handle today's volume of traffic but, surely, no one can state that this long-ago acquired knowledge has been adequately implemented."

The existing dilemma is not due solely to lack of equipment, personnel or a combination of both, Smith said. Improved operations efficiency and safety can be attained, he said, by making maximum use of available tools, and interim relief is essential until the Common System can be realized.

"The long-range solution should have the basic requirement permitting an expeditious and orderly transition. We have learned from sad experience that we cannot go directly from one system to another overnight," Smith stated.

Smith raised the point that before there can be any ultimate solution there must be common agreement among all classes of users on "what is the capacity they want the future traffic control system to have." This question was answered by Capt. S. P. Saint, traffic control expert of the Air Transport Assn. With acceptance of 12 operational requirements he proposed, prototype hardware leading to an automatic air traffic control system could be developed within one year, he said.

Among these requirements were: the mingling of jets and piston types in the landing sequence with no reduction in the landing rate; 60 landings and 60 takeoffs per hour on dual runway; full non-interfering use of airports as close together as in the New York area; allowing flights to climb, cruise and descend within each plane's best performance ranges; jets must not be held below 20,000 ft. except in emergency; ability to handle aircraft that do not have the airborne equipment most favorable to the system; the new system must provide operational advantages in proportion to the number of equipped aircraft and must not suffer a loss of capacity or efficiency on reaching saturation.

Tie-in With SAGE

Saint contended that these requirements can be met with procedures that will be operationally acceptable. He said he thought the electronic hardware needed to implement such an operational philosophy could be built quickly within practical limits of cost, weight and technical complexity. Saint specifically suggested a system independent from SAGE, the $3 billion USAF air defense Semi-Automatic Ground Environment project under consideration for dual service as an air traffic control system. However, Saint said his proposed system could be electronically married to the SAGE defense system and thus make use of elements of SAGE to avoid duplication.

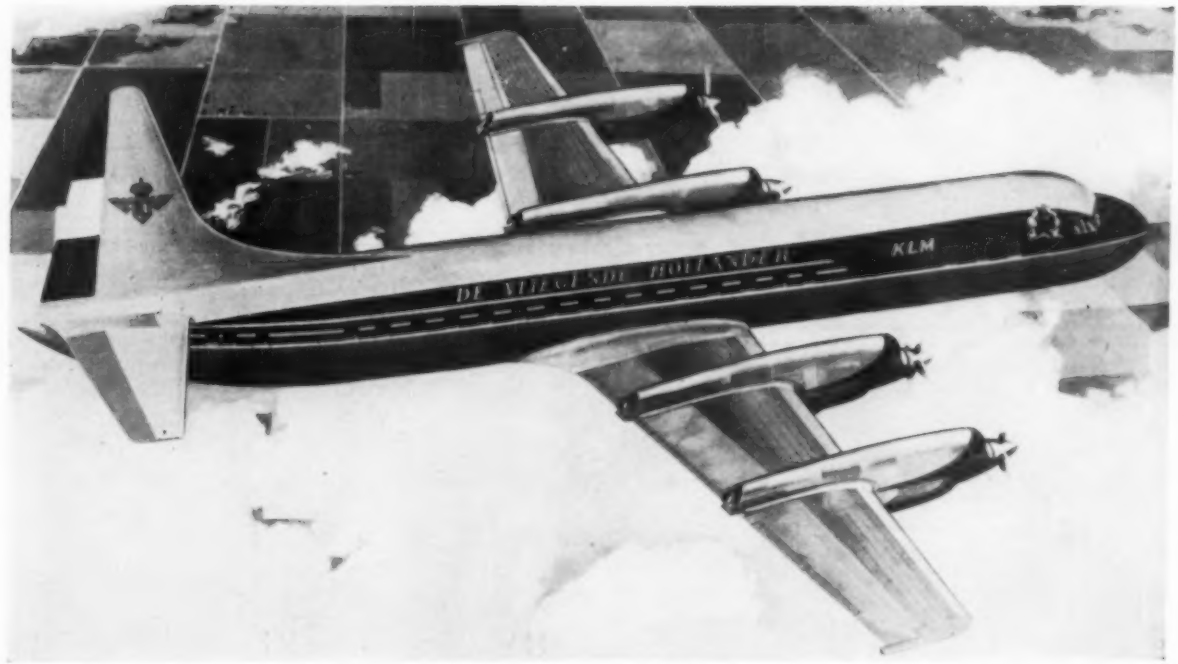
In this same vein, David S. Little, operations supervisor of American Airlines, proposed a welding of CAA air traffic control and Air Defense Command requirements. He said there is no reason for not merging the requirements of air defense with those of an all-airspace control system to provide both with maximum economy of national manpower and minimum expenditures on critically complex electronic components.

Col. L. S. Lightner, chief of the USAF air traffic control branch, declared that the Air Force's whole program is to go in the direction indicated by Little. He answered repeated allegations that the Air Force was seeking to take over by stating flatly: "The Air Force does not want to control civil traffic." Lightner said USAF domestic training of traffic controllers is necessary to help provide a reservoir of personnel needed for manning overseas stations. He said that where there is sufficient U. S. civil traffic near military installations, USAF invites the CAA to man and operate the facility. What USAF would like to do, he said, would be to have more joint use of traffic control personnel.

Controllers' Pay

Air Line Pilots Assn. has proposed and is strongly pushing a demand for increased pay for air traffic controllers. Members are being urged to ask their Congressmen and Senators to promote pay raises for Civil Aeronautics Administration tower operators.

ALPA is alarmed over the Air Force's civilian traffic controller recruitment program, which has successfully attracted key CAA personnel because of pay differentials. A commensurate pay scale coupled with improved working conditions for civil air traffic controllers to provide and maintain the highest level of experience and proficiency is important to the industry as well as the pilot, ALPA contends.



KLM Orders 12 Electras

KLM Royal Dutch Airlines announced an order last week for 12 Lockheed Electras (shown in sketch above with KLM markings) at a cost of $30 million. The turboprop transports, powered by Allison 501 (T-56) engines, are scheduled for delivery beginning in 1959.

Cargo Airlines Win Mail Rights

Washington—Slick Airways and the Flying Tiger Line won a five year renewal of their operating authority in the Civil Aeronautics Board's decision on the east-west portion of the airfreight renewal case. The Board also decided to allow the four domestic cargo airlines to carry mail without subsidy.

The CAB decision extends Flying Tiger and Slick's operating authority to air mail and express for the first time, although the carriers, along with Riddle Airlines, were previously authorized to carry surface mail.

Riddle and American Air Export and Import Co. also get air mail authority for the first time, although both were approved for express service when they were certificated for five years in the north-south portion of the case, decided last November. The new mail authority was granted for a one year experimental period for all four carriers.

The mail issue produced a split decision on the CAB, which acted unanimously on the rest of the case. The majority determined that the Board has the power to issue a mail certificate which excludes subsidy and decided that there is a public need for mail service under those specific conditions.

Pointing out that the Postmaster General strongly supported the cargo carriers for mail service, the Board said that availability of the capacity of the cargo lines will add flexibility to postal operations and make the department's job of handling the mails easier.

CAB member Harmar D. Denny voted with the majority on the mail issue, but he attached a statement in which he emphasized that he regards the grant of mail authority for one year strictly an experimental and test period to gather evidence for future appraisal.

Member Chan Gurney dissented on the mail authority. He finds no present inadequacy of services, and he doesn't think the cargo carriers will provide the service the Post Office needs.

The Board decided to renew the cargo carriers' certificates for five years instead of the seven years recommended by the examiner. The shorter period was found advisable in view of Slick and Tigers' past unprofitable cargo operations and the many undeveloped aspects of their services.

The authority to carry mail was limited to one year because the CAB feels it is pioneering in a new and untried field, and a one year trial will test the soundness and value of the experiment.

The CAB also disagreed with the examiner's recommendation that a restriction be placed on the carriers' authority to make operational stops at off-route points.

The Board decided to continue the operational flexibility permitted in the past as an aid in the development of the inter-area freight routes.

A limited number of marginal cities were recertificated for demand-type service.

The Board rejected contentions that such service isn't justified.

Flying Tiger Line was certificated to operate between these groups of cities: Los Angeles, San Diego and San Francisco-Oakland; Portland and Seattle; Minneapolis-St. Paul; Salt Lake City and Denver; Des Moines and Omaha; Akron, Cleveland, Toledo, Detroit, Grand Rapids, Milwaukee, South Bend and Chicago; Albany, Binghamton, Buffalo, Rochester, New York-Newark, Philadelphia, Hartford-Springfield, Providence and Boston.

Service by Flying Tiger on a demand basis is authorized for Salt Lake City, Denver, Omaha and Des Moines. Service to Providence, Albany, Rochester, Akron, Toledo, South Bend, Grand Rapids and San Diego can be furnished by truck to the nearest regularly served airport.

Slick is authorized to operate between: Los Angeles, San Diego and San Francisco-Oakland; Phoenix; San Antonio, Houston, Fort Worth-Dallas and Oklahoma City; Wichita and Kansas City; Pocatello, Idaho; Louisville, St. Louis, Indianapolis, South Bend, Cincinnati, Dayton, Columbus, Akron, Cleveland, Toledo, Detroit and Chicago; Nashville; Pittsburgh, Richmond, Baltimore, Washington, Wilmington, Del., Philadelphia, New York-Newark, Hartford-Springfield, Providence and Boston.

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Nehru Inspects Ilyushin 14

Prime Minister Pandit Jawaharlal Nehru of India on an inspection tour of the custom-built interior of the Ilyushin 14 presented to him by Soviet Prime Minister Nikita Khrushchev following his winter visit to India (AW Mar. 12, p. 58). The Ilyushin, which now carries Indian air force markings has been christened Meghdoot, or "Messenger of the Clouds." Directly behind the prime minister is his grandson, Rajiv Nehru Ghandi.

CAB Orders

(Feb. 23-29)

GRANTED:

Leave to intervene in the Great Lakes-Southeast service case to Allegheny Airlines, Lake Central Airlines, Mohawk Airlines, North Central Airlines, the City and Chamber of Commerce of Atlanta, Ga.; the City and Chamber of Commerce of Charlotte, N. C.; the City and Chamber of Commerce of Columbus, Ohio; the City and Chamber of Commerce of Dayton, Ohio; the City and Chamber of Commerce of Tampa, Fla.; Pinellas County, St. Petersburg, Fla., Chamber of Commerce and Clearwater, Fla., Chamber of Commerce. Petitions of Continental Air Lines and the City and Chamber of Commerce of Nashville, Tenn., were denied.

United Air Lines an exemption to provide free transportation to technical employes of Radio Corporation of America for inflight observation, for six months.

Acme Air Cargo Inc. leave to intervene in the proceeding involving the application of Cuban Colonial Air Express Corp. to operate as an indirect air carrier between points in the United States and Cuba.

Southwest Airways authority to suspend service at Ukiah, Calif. until runway repairs are completed.

West Indies Airways an exemption to operate an air taxi service in frequent and regular air transportation between San Juan, P. R., and various Caribbean points with certain conditions, for two years or until 30 days after a certificate is issued authorizing service between any two points involved.

Southwest Airways an exemption to permit the purchase of three Martin 2-0-2 aircraft from Pioneer Aeronautical Services.

Allegheny Airlines an exemption to permit the purchase of two Martin 2-0-2 aircraft from Pioneer Aeronautical Services.

APPROVED:

Agreement between various carriers adopted by the International Air Transport Assn. relating to the carriage of tourist passengers during the 1956 summer season by Alitalia in the first class cabin on night services London-Milan and London-Rome. The agreement is subject to safeguards against any competitive pressure to upgrade tourist services.

Resolutions between various carriers adopted by the traffic conferences of the International Air Transport Assn. relating to changes in fares.

Interlocking relationships between South Pacific Air Lines, Robert Dollar Co., Dollar Associates, Inc., Globe Wireless, Ltd., R. Stanley Dollar, R. Stanley Dollar, Jr., J. Harold Dollar, Jr., J. D. Hopkins, R. P. Seeley, E. H. Hall, and C. W. Gabrielson.

Agreements among Pan American World Airways, Lineas Aereas Costarricenses, Transportes Aereos Nacionales, Aerovias Sud Americana and Taca International Airlines relating to cargo rates in the Caribbean area.

Agreements involving Capital Airlines, Slick Airways and various other carriers relating to intercarrier arrangements.

ORDERED:

Various applications of Eastern Air Lines, American Airlines, Capital Airlines, Capitol Airways, Delta Air Lines, National Airlines, Northwest Airlines, Riddle Airlines, Trans World Airlines and United Air Lines consolidated with the Great Lakes-Southeast service case.

Slick Airways, Flying Tiger Line and other parties to show cause why the Board should not disapprove agreements between the airlines and various freight forwarders and trucking companies which provide for commissions in excess of the usual 5%. The parties can ask to withdraw the agreements, request they be assigned for hearings and oral argument or submit additional information they think will warrant approval.

Mohawk Airlines' temporary mail rate set at the rate proposed by the Board in its show cause order for the period July 1, 1955 to June 30, 1956, and for the period starting July 1, 1956.

Japan Air Lines' foreign air carrier permit amended to substitute "a point or points in Japan" for the term "the terminal point Tokyo, Japan" on each of the carrier's routes.

Information filed by American Airlines, Capital Airlines, New York Airways, Northeast Airlines, Pan American World Airways, Piedmont Aviation, Trans World Airlines, United Air Lines and Western Air Lines in the preliminary reports on Schedules A and B of CAB form 41 for the fourth quarter of 1955 withheld from public disclosure until final schedules are filed or expiration of the time for filing such schedules, whichever occurs first.

DISMISSED:

Continental Southern Lines and Transcontinental Bus System's joint application for approval of transfer of certificate, since the application is now moot.

Trans-Air Hawaii Ltd.'s appilcation for air service in the Hawaiian Islands, since the application is now moot.

Continental Southern Lines and Transcontinental Bus System's joint application for approval of an agreement whereby Transcontinental would acquire all the capital stock of Continental Southern Lines, since the application is now moot.

DENIED:

North Central Airlines and Allegheny Airlines' motion to defer the Lima-Detroit service case for consideration with the Great Lakes local service area proceeding.

Petition of the Minneapolis-St. Paul Metropolitan Airport Commission to include the issue of nonstop service between the Twin Cities and Los Angeles in the Caspar cut-off renewal case.

American Shippers, Inc.'s motion to dismiss the investigation of the petition of Slick Airways for amendment of the minimum rate order.

(Mar. 1-7)

GRANTED:

Roland F. Beers Inc. authority to use Canadian-registered Bell helicopter CF-FCO to conduct airborne geophysical surveys with electromagnet equipment within the states of Illinois, Iowa, Wisconsin, New York, Virginia, Georgia and North Carolina, until Apr. 6, 1956.

United Air Lines an exemption for one year to permit the carrier to overfly New York/Newark on all-cargo flights between Boston and Springfield/Hartford and Philadelphia, providing local traffic isn't carried between Boston or Hartford/Springfield and Philadelphia, Allentown/Bethlehem/-Easton, Bradford, Youngstown or Akron.

Frontier Airlines an exemption to operate a daily round trip between Albuquerque and Silver City, N. M., for one year.

Braniff Airways, Continental Air Lines, the Chamber of Commerce of Denver,

Colo., and the Chamber of Commerce of Colorado Springs, Colo., leave to intervene in the Liberal service case.

Riddle Airlines an exemption to lease one C-46 aircraft from Argonaut Airways Corp.

Hycon Aerial Surveys authority to use Canadian-registered Canso PBY-5A CF-IKO to conduct airborne geophysical explorations in the United States on a general contract basis, until Sept. 1, 1956.

Flying Tiger Line an exemption to perform transatlantic charter flights for the Commerce Social Club, Clan MacKenzie, Arminius Social Club, Bureau of Aeronautics Recreation Assn., Interior Dept. Recreation Assn. and Desert Thermal Flying Club, subject to certain conditions. Application to perform a flight for the National Education Assn., was denied.

Cordova Airlines authority to suspend service over the route between Anchorage and Cantwell, Alaska, until 60 days after decision in the Intra-Alaska investigation case.

APPROVED:

Agreements involving Delta Air Lines, National Airlines and various other carriers relating to intercarrier arrangements.

Agreement between Railway Express Agency and Riddle Airlines relating to the transportation of air express.

Interlocking relationships between New York Airways, New York City Omnibus Corp. and Robert G. Goelet.

ORDERED:

Frontier Airlines' preliminary report on Schedules A and B of CAB Form 41 for the fourth quarter of 1955 withheld from public disclosure until the final schedules are filed or the time for filing such schedules expires, whichever occurs first.

Applications filed by Trans World Airlines, Western Air Lines, Continental Air Lines, United Air Lines, Frontier Airlines, Bonanza Air Lines and the City of Phoenix consolidated into the Phoenix service case.

Applications filed by Central Airlines, Frontier Airlines, Ozark Airlines, City of Liberal, City of Guymon, City of Enid, City of Borger, City of Oklahoma City, County of Prowers and the City and Chamber of Commerce of Lamar, and the City of Amarillo consolidated into the Liberal service case.

DISMISSED:

Application of the Chamber of Commerce of Hickory, N. C., for service to Washington and Atlanta, since the applicant has failed to express an interest in prosecuting the application.

DENIED:

Motions for consolidation with the reopened Bonanza renewal case of applications filed by Bonanza Air Lines, United Air Lines and Western Air Lines.

Applications of Bonanza Air Lines and the City of Palm Springs, Calif., for exemption authority to allow Bonanza to serve Palm Springs while service by Western Air Lines is interrupted by a strike.

Blatz Airlines' application for exemption authority to operate between Burbank, Calif. and Las Vegas, Nev. under a contract with The Showboat, a club and hotel in Las Vegas.

COCKPIT VIEWPOINT

By Capt. R. C. Robson

Ground Radar, Friend or Foe?

Incidents occasionally arise which cast a bad light on ground radar, its use and the people who use it. The ILS-GCA feud of a few years ago was an example of this. Then there was the debate (not settled yet) as to whether GCA information was mandatory on certain instrument approaches. More recently, there have been cases where radar was cast in the role of an electronic detective providing evidence leading to pilot violation proceedings.

The CAA has given assurance that spying is not the intended use for radar. On the other hand, regulatory or policing agencies cannot ignore evidence of lawlessness, regardless of the source of such evidence. And this is understood by pilots. No one is interested in blindly shielding a law breaker. But there is a vast gulf between deliberately violating a rule and exercising the judgment needed in the cockpit of a modern airplane in today's traffic.

Here is a quote from a letter which illustrates this situation. The letter was addressed to the pilots of a U. S. airline and concerns an incident involving one of their pilots:

Radar vs. Reaction

"On Thursday, January 12, 1956, a pilot was informed by a CAA Safety Agent that he had conducted his approach below the minimum altitude before attaining visual reference on his approach to San Francisco International Airport. The basis for this conclusion on the part of the CAA was that he was under radar observation and was observed to be at 180 feet when he reported the approach lights in sight. He was further criticized for his failure to report the runway lights in sight.

"Assuming the airplane was descending at the rate of 500 fpm., the lights were observed at the 200 foot minimum and the pilot had only descended 20 feet when the radio transmission was made, this pilot possesses a reaction response that makes all electronic computers obsolete. With half of this ability Billy the Kid would have decimated the area west of the Mississippi River."

This, as you can see, is not a clear cut case of an illegal flight procedure. It is a case of somebody on the ground trying to tell the pilot what he saw—or didn't see. It apparently ignores altimeter lag, hysteresis and legal, licensable error. Furthermore there is no regulation which binds a pilot to report any kind of lights—it has simply been a courtesy extended to help expedite the approach of the next aircraft. An IFR clearance doesn't even have to be canceled until the plane is on the ground.

Let Pilot Steer Plane

Matter of fact we do many things in the air out of courtesy. We make short turns, keep a high airspeed, "cancel IFR" as soon as possible—all to help the next in line—just as you move to the rear of an elevator or do countless other little favors for your fellow man. But if we're going to get clobbered for being polite why bother?

Pilots understand that observation of radar in actual operation is necessary in order that information may be gathered relevant to setting up more efficient traffic control procedures. Indeed, we welcome any assistance that is sensible and allows more flights to be completed. But the thousands of variables, called experience, by which an airplane is flown, as well as the courtesies used, cannot be expounded in detail to every individual in aviation.

If it develops that overzealous CAA agents are attempting to misuse radar information, i.e. to steer the airplane from the ground, then the use of radar may be that much harder to "sell" to pilots.

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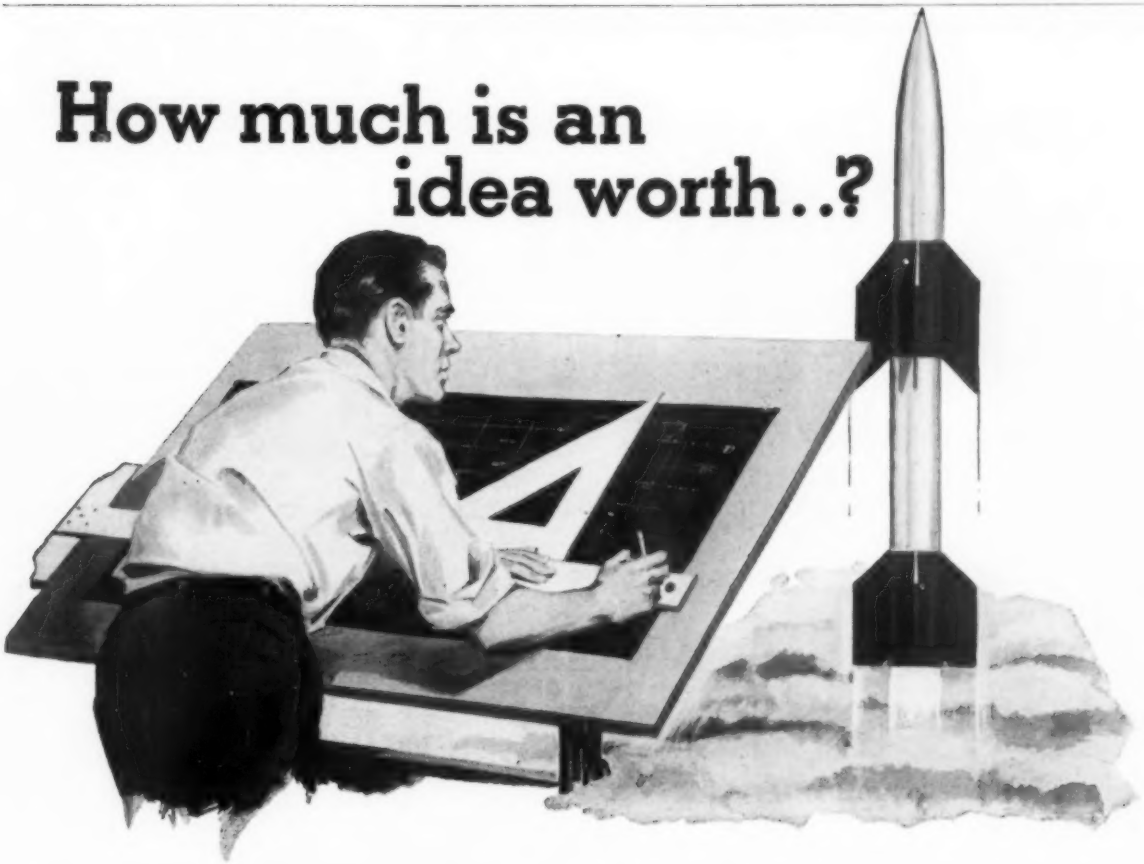

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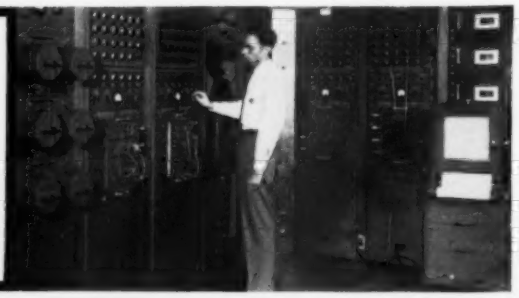

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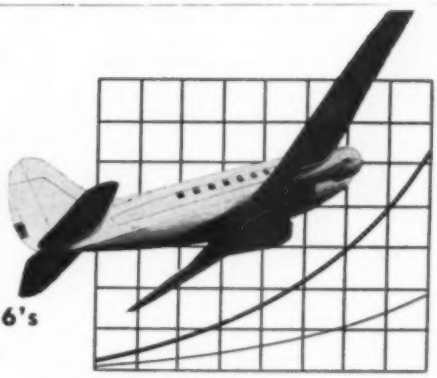

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LETTERS

'Where's Dinwiddie?'

The Aircraft Communications Problem articles by Captain Robson should be required reading by all Air Route Traffic Control supervisors and SYSTEM makers.

Captain Robson writes from the viewpoint of an airline pilot thoroughly familiar with his route, its fixes, its mileages, its radio frequencies and its traffic control peculiarities. In that sense, he knows what to expect. He is undoubtedly assisted by a competent co-pilot and possibly a flight engineer who can assume certain flying duties. Robson is to be congratulated on focusing attention on the fact that even a well trained crew team can't always keep up with the airways communications and reporting SYSTEMS.

Taking up from where Captain Robson leaves off, may we further consider the problem of a solo jet jockey during an instrument weather flight. First, he is all harnessed up in and sitting upon a hard parachute pack. He wears a pot on his head and he can't look down over his nose because of oxygen mask and hose fittings. Even if he could comfortably see the chart book on his lap (if a stick between his legs constitutes a lap) it is most annoying not to be able to wet his finger to flip a page. He may be doing five to 10 miles per minute over a strange route in a sensitive, conditionally unstable aircraft.

Rock 'n Roll

When his eyes leave the instrument panel, the kite starts to rock, to roll and to pitch. To avoid this condition, the jet jockey may have spent hours on the ground preparing a flight plan and condensing important enroute information on to a three-by-five-inch card which he can affix over his heading gyro just so he won't have to take his eyes away from the rock and roll indicators.

He plans his thinking 10 to 15 minutes ahead representing blocks of a hundred miles or so. He must necessarily ignore the details of many interesting but obscure points along the route. The flight has been progressing fairly well but now it starts.

The headset squawks, "Report passing Dinwiddie."

Our boy is anxious to comply but where is Dinwiddie? It is not on the carefully prepared flight plan card. Mustn't seem too dumb now, better look it up on the main chart book. In the meantime, rock and roll and pitch. Now it turns out that Dinwiddie is the intersection of two separate low frequency range beam legs, neither one of which is tuned in on the ship's lone low frequency receiver.

Farewell Dinwiddie

So, he tunes, he checks, he listens, he rocks, he rolls, he pitches. One has to be sure, and the station identification aural code signals are transmitted 30 seconds or so apart. After a bit, it dawns on the head under the pot that the fix has been overshot during all the grinding and tuning. Never mind that because after all, he is still headed in the right direction. Tune in something ahead. Langley should do. It's the termination point.

Now think up an estimated time of arrival (somebody is going to ask that) and, oh yes, a guesstimate as to when Dinwiddie was passed. Now what is that red light flickering—better get your mind on your fuel system buddy or you won't have to worry about clearances. And speaking of the devil, here comes another one. "You are now cleared to Morrison, maintain 30,000." And NOW where is Morrison?

Now Where's Morrison?

It's not listed on that neat flight plan you made either—you must have goofed some way in preparing that flight plan card. So dive into the chart book again—he rocks, he rolls and he pitches, but it is really worth it because it has now been discovered that Morrison is a low powered homer about a couple of minutes jet flying time short of Langley. At 30,000 feet, the background of higher powered distant radio stations preclude tuning in the little low powered homer. But it is fun to try.

He pitches, he rocks and he rolls. The radio compass needle just spins and the earphones don't have proper rock and roll music. Better try something else.

Let's forget this darn clearance and tune in Langley Range and get some idea of the position in space. What's that! Langley is dead behind so reverse direction and get back there. It takes 5 minutes to get back at jet speed.

Langley at Last

Gosh, there must have been a terrific tail wind at the altitude to get that far off—better think up that violation report in case some one spotted that uncleared 25 mile overshoot in the radar scope. One thing, though, things are working swell now. The needle is solid on Langley again. Come to think of it, isn't that the station that was tuned in when all this stuff about Dinwiddie and Morrison started?

Now the moral for the SYSTEM makers is this: Captain Robson made a masterpiece of understatement when he said in his article, "When ARTC requests a report to an unnatural station or when pilots must locate an obscure place on a map extra time is involved."

Right now, there is one consolation. There aren't too many people at 30,000 ft. and an overshoot of 25 miles or so probably won't make any difference, but that is going to change. At jet speeds time is of the essence. In order to keep track of himself, a pilot must think in terms of speed blocks ahead and if stumbling block clearances, which use any other than prominent fixes are tossed at him, there is bound to be confusion.

Also, the requests must be made in time for a pilot flying blind to comply with them, by the means at his disposal, or things are going to be one grand mess in 1960 when Captain Robson et al will be breezing around at 30,000.

ROBERT E. TRIMBLE
1708 "W" Street, S. E.
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Aviation Week welcomes the opinion of its readers on the issues raised in the magazine's editorial columns. Address letters to the Editor, Aviation Week, 330 W. 42 St., New York 36, N. Y. Try to keep letters under 500 words and give a genuine identification. We will not print anonymous letters, but names of writers will be withheld on request.

On Drag Chutes

After reading the comments of Mr. G. L. Patterson, Jr. in the January 30th issue of AVIATION WEEK on the subject of Anchors for the Republic F-84F, I believe a discussion on the use of drag chutes for landing is in order.

The philosophy of installing drag chutes may vary; however, the general advantages for such installations may be summarized as follows:

1. To provide positive decelerating forces under all conditions. This will permit operating from a given field regardless of the runway conditions.

2. To provide emergency braking in case of a failure in the normal braking system due to the loss of hydraulic power, etc.

3. To augment the normal braking system and provide the capability of operating from shorter runways such as those which may be encountered in any forward combat zone.

4. To save tire wear.

With these concepts in mind I believe an example using an airplane such as the F-84F will insure answering Mr. Patterson's question of "why an anchor. . . ." Assume the aircraft is operating from a field which has a 6,000 foot runway. Since in normal landing procedure, the pilots do not touchdown at the beginning of the runway nor stop at the end of the runway, there will be no more than 75% of the runway for the ground roll portion of the landing.

The following table gives the comparative ground roll distance for an average touchdown speed and the normal landing gross weight of approximately 16,000 pounds.

Retarding Force	Wheel Brake and Wheel Brakes		16 Foot Chute	
Runway Conditions	Dry	Icy	Dry	Icy
Ground Roll (ft.)	4,000	12,000	2,100	4,500

From the figures listed above it can be seen that the greatest advantage of the chute is in operating under conditions of icy runways or in emergencies where the normal braking system is not available. In addition, the drag chute provides the capability of stopping in a distance of 2,100 feet. This feature permits operating from forward bases where long runways are not available.

The figures given above are for average operating procedures. Variations in pilot landing techniques can result in changes of landing roll distances by as much as ±25%.

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appropriateness.

re·li′a·ble (rē·lī′*ə*·b'l), *adj.* Suitable or fit to be relied on; worthy of dependence or reliance.

re·l

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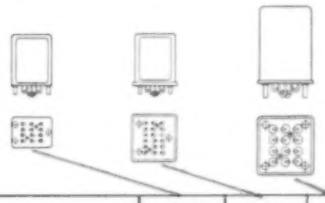

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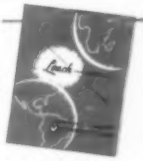

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